Draft Supplemental Environmental Assessment for the Roberts Road SpaceX Operations Area Expansion & Supporting Infrastructure on Kennedy Space Center

September 2023

Executive Summary

Under the supervision of the National Aeronautics and Space Administration (NASA), Space Exploration Technologies Corporation (SpaceX) has prepared this Supplemental Environmental Assessment (SEA) to the 2018 Final Environmental Assessment (EA) for Space Exploration Technologies Operations Area on Kennedy Space Center. NASA is the lead federal agency responsible for evaluating the environmental impacts of actions which are proposed to occur on NASA jurisdictional property. This SEA evaluates the potential environmental impacts resulting from the proposed consolidation of SpaceX operations in Brevard County, Florida which includes infrastructure construction and improvement projects on John F. Kennedy Space Center (KSC). This action is needed to support an expansion of SpaceX operations and would promote more efficient support with reduced cost to federal and commercial SpaceX customers. This SEA has been prepared in accordance with the requirements of the National Environmental Policy Act (NEPA) of 1969, as amended (42 United States Code [U.S.C.] 4321, et seq.), the Council on Environmental Quality regulations for implementing NEPA (40 Code of Federal Regulations [C.F.R.] parts 1500-1508), NASA regulations for implementing NEPA (14 C.F.R. Subpart 1216.3), and the NASA Procedural Requirement (NPR) for Implementing NEPA and Executive Order 12114 (NPR 8580.1). This SEA is necessary to inform NASA decision making concerning SpaceX's proposed development of federally owned property. This SEA not only ensures agency compliance with NEPA, but analyzes the environmental impacts of compliance with other related federal and state environmental laws and regulations.

Purpose and Need

The purpose of NASA's action is to fulfill its mandate to encourage the fullest commercial use of space, advances NASA's mission to foster a commercial space launch and services industry, and improves the return on taxpayer investment in KSC spaceport facilities through expanded and improved utilization. NASA's execution of real property agreements for use of KSC by other governmental agencies, commercial space and related industries, and universities fulfills this mandate and furthers the goals of KSC long-term planning initiatives and NASA programmatic objectives, and ultimately increases American competitiveness in commercial space. NASA's action fulfills the KSC Master Plan objective to "foster and support the fullest commercial use of space," and is consistent with national directives outlined in the Commercial Space Launch Act, the National Space Policy, and the National Space Launch Policy. Commercial use of KSC real property supports NASA's mandate to encourage the fullest commercial use of space, supports the goals of the National Aeronautics and Space Act, and advances the National Space Policy that federal agencies shall ensure that U.S. Government space technology and infrastructure is made available for commercial use on a reimbursable, noninterference, and equitable basis

The purpose of SpaceX's proposal is to increase the capabilities, efficiency, and cost effectiveness of SpaceX's production and launch support operations in Brevard County, Florida. Consolidation of operations would allow SpaceX to reduce the time it takes to produce, launch, and refurbish rockets to meet the growing demand for launch services from the U.S. government, allied foreign governments, and commercial customers. Demand for launch services has continued to increase over the past 10 years, and the space industry growth projections indicate this will continue into the foreseeable future. SpaceX is launching at an average of nearly twice a week and has over 100 missions on its manifest in 2023 - most of those missions are from Cape Canaveral Space Force Station (CCSFS) and KSC. To meet the additional

and growing demand of the U.S. government, allied foreign governments, and commercial customers, and to accomplish SpaceX's goal of streamlining operations and increasing cadence, SpaceX needs additional land in proximity to where it already has facilities and to construct supporting infrastructure at KSC.

Proposed Action

NASA proposes to amend the existing "Enhanced Use Lease" (EUL) with SpaceX, which would allow SpaceX to expand its Roberts Road Operations Area, upgrade the utilities, and widen Saturn Causeway to support vehicle transport to and from launch facilities. Under the Proposed Action, SpaceX would expand the Roberts Road Operations Area by 100 acres immediately north of the existing site. Development would include additional office space and industrial facilities in support of vehicle and payload processing, fabrication, storage, manufacturing, and shipping and receiving. The total footprint of the new facilities would not exceed 1.5 million square feet and facility height would not exceed approximately 400 feet. Upgraded utilities at the site include new underground electrical feeder lines, fiber communication connectivity, water, and wastewater. SpaceX would also construct improvements to the intersection of Kennedy Parkway and Roberts Road, if needed, as the site develops to maintain acceptable traffic conditions.

Saturn Causeway would be widened approximately eight feet from the Vehicle Assembly Building to Phillips Parkway and drainage swales would be improved. A new electrical duct bank from the C5 substation is proposed within the roadway footprint to support operations at Launch Complex 39A.

Alternative 1

Under Alternative 1, SpaceX would expand its Roberts Road Operations Area south of Roberts Road by approximately 115 acres due to the proximity of the Florida Power and Light solar farm and transmission lines. A 100-acre site identical to the Proposed Action is not possible due to these neighboring features, thus additional land is needed to support the same type of operations. Building composition would be similar to the Proposed Action, but may be differently sized due to the different dimensions of the site boundary. Alternative 1 would require construction of new utility farms and the extension of existing utilities across Roberts Road, including but not limited to a new pneumatic gas farm or several thousand feet of high-pressure gas lines, a second set of transformers and electrical feeders, a second wastewater lift station, sanitary sewer network, new connections to KSC's sanitary sewer network, and construction of an additional NASA demarcation point for communication equipment. The widening of Saturn Causeway and utility upgrade would also be constructed under this alternative.

No Action Alternative

Under the No Action Alternative, the existing EUL between NASA and SpaceX would not be amended, expansion of the Roberts Road Operations Area would not occur beyond what is currently authorized, and SpaceX would not further consolidate its operational footprint on KSC. SpaceX's operations in Brevard County would continue; however, they would occur at disjunct facilities. Saturn Causeway widening and utility upgrades would not occur. SpaceX's ability to provide more efficient, low-cost, reliable access to and from space would not be realized. The No Action Alternative would not meet the Purpose and Need for the Proposed Action.

Summary of Potential Environmental Effects

This SEA considered the following resource areas to provide a context for understanding the potential environmental effects of the Proposed Action and alternatives: land use/visual resources, biological resources, cultural resources, air quality, climate, water resources, geology and soils, transportation, utilities, and hazardous materials and hazardous waste. Noise, health and safety, socioeconomics, and environmental justice were considered but not analyzed in detail, as they were the same or comparable to those impacts analyzed in the 2018 EA.

The environmental consequences associated with the Proposed Action, Alternative 1, and the No Action Alternative were analyzed for the appropriate region of influence for each resource area. A summary of the resources considered and the potential impacts on those resources is included in Table ES-1 and Table ES-2. The descriptions include both construction and operational impacts associated with the Proposed Action and Alternative 1. The No Action Alternative would result in no new facilities or construction beyond what is currently authorized in the 2018 EA, or re-designation of land use or the Spaceport Growth Boundary.

Potential Impact
The Proposed Action and Alternative 1 would require a land use change from Operational Buffer/Conservation to Launch Operations and Support. The site is currently managed by the United States Fish and Wildlife Service and would be removed from the Merritt Island National Wildlife Refuge oversight. The land would no longer be available for controlled burning operations. The change in land use designation and subsequent effects would result in a moderate impact.
The Proposed Action or Alternative 1 would result in a moderate impact to visual resources. The Proposed Action would be consistent with existing visual landscape and is located in an area of low viewer sensitivity. Much of the development would be obscured from viewers by existing vegetation and topography. The Proposed Action and Alternative 1 are also consistent with the Florida Coastal Management Plan and would not result in a significant impact to the coastal zone.
Construction of the Proposed Action or Alternative 1 would result in direct, short- term, moderate impacts to biological resources as 100 and 115 acres of relatively undisturbed habitat, respectively. However, these habitats make up a small percentage of suitable habitat available at KSC and the Merritt Island National Wildlife Refuge. Mitigation measures would be implemented during construction to reduce potential impacts to species. Operation of the Proposed Action or Alternative 1 would result in long-term, minor impacts. Prescribed burning would continue to be conducted with sufficient frequency in adjacent burn units to maintain suitable habitat. Impacts to Florida scrub-jay habitat would be mitigated as outlined in the KSC Florida Scrub-Jay Compensation Plan. Mitigation to reduce bird collisions will be addressed in the final design and will comply with all FAA obstruction and marking guidelines. Nighttime lighting impacts would be minimized by compliance with the KSC exterior lighting requirements. Accordingly, after mitigation the Proposed Action or Alternative 1 would not result in significant

Table ES-1. Description of Potential Environmental Impacts

Resource Area	Potential Impact
Cultural	There would be no impact to any historic resource as a result of the Proposed
Resources	Action or Alternative 1.
Air Quality	The Proposed Action and Alternative 1 would result in short-term, minor emissions
	associated with. Construction. Once the final construction plan is determined and
	facilities are constructed, an emissions inventory would be prepared to determine
	if a Title V permit is necessary. The Proposed Action would not result in traffic
	volumes high enough to have potential effects from mobile source air toxics.
Climate	The small amount of greenhouse gases resulting from construction and operation
	of the Proposed Action or Alternative 1 would have long-term, minor impact on
	global climate change, sea level rise, or any potential impacts of climate change.
Water	Construction of the Proposed Action would impact up to approximately 68.2 acres
Resources	of wetlands and surface waters. Construction of Alternative 1 would impact up to
	approximately 102 acres of wetlands and surface waters. However, these make up
	a small percentage of wetlands at KSC and thus would result in short-term,
	moderate, adverse impacts to surface waters. Compensatory mitigation to offset
	impacts would be required as part of the permitting process and would be subject
	to regulatory approval. Best management practices would be implemented to
	reduce potential impacts due to runoff and/or inadvertent discharge. The Proposed
	Action and Alternative 1 would require development within the 100- and 500-year
	floodplains.
Geology and	There are no unique geological features of exceptional interest or mineral
Soils	resources within the Proposed Action or Alternative 1. Overall there would be
	minor impacts to geology and soils.
Transportation	The Proposed Action and Alternative 1 would result in a minor impact to the
	transportation network. Up to approximately 5,200 trips per day may be generated
	by the site development. As the site is developed and operated, intersection
	improvements may be constructed at Kennedy Parkway at Roberts Road to
	maintain an acceptable level of service.
Utilities	Impacts to utilities at KSC would be minor. The Proposed Action and Alternative 1
	would require extension and/or connection to existing water, wastewater,
	electrical, and gas lines. Wastewater is not anticipated to exceed the capacity of
	the Cape Canaveral Space Force Station Regional Wastewater Treatment Facility
	but would be treated on-site or hauled off if necessary. Power would be provided
	by the C5 and proposed Saturn Substation within existing utility or transportation
	corridors. Alternative 1 would require new on-site utility farms and the extension
	of existing utilities across Roberts Road.
Hazardous	Hazardous materials and waste would be managed in accordance with federal,
Materials &	state, and local laws and regulations. The Proposed Action and Alternative 1 would
Hazardous	be consistent with existing SpaceX operations, as many processes would be
Waste	relocated from other facilities within Brevard County, Florida. Payload processing
	would be conducted in manners similar to how they currently are at KSC and Cape
	Canaveral Space Force Station.

Table ES-2. Summary of Potential Environmental Impacts

Resource	Proposed Action	Alternative 1
Land Use/Visual Resources	Long-term, moderate	Long-term, moderate

Resource	Proposed Action	Alternative 1
Coastal Zone	Short-term, minor	Short-term, minor
Habitats and Vegetation	Construction: Short-term,	Construction: Short-term,
	moderate	moderate
	Operation: long-term, minor	Operation: long-term, minor
Wildlife and Protected Species	Construction: Short-term,	Construction: Short-term,
	moderate	moderate
	Operation: long-term, minor	Operation: long-term, minor
Cultural Resources	No impact	No impact
Air Quality	Short- and long-term, minor	Short- and long-term, minor
Climate	Long-term, minor	Long-term, minor
Surface Waters	Construction: Short-term,	Construction: Short-term,
	moderate	moderate
	Operation: long-term, minor	Operation: long-term, minor
Floodplains	Short-term, moderate	Short-term, moderate
Groundwater	Short-term, minor	Short-term, minor
Geology and Soils	Short-term, minor	Short-term, moderate
Transportation	Long-term, minor	Long-term, minor
Utilities	Long-term, minor	Long-term, minor
Hazardous Materials & Hazardous Waste	Long-term, minor	Long-term, minor

Cumulative Impacts

Cumulative impacts are defined by the Council on Environmental Quality in 40 C.F.R. § 1508.1(g)(3) as impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. These regulations further require that NEPA environmental analyses address connected, cumulative, and similar actions in the same document (40 C.F.R. 1508.7). The cumulative impact analysis for this SEA focuses on the incremental interaction the Proposed Action may have with other past, present, and reasonably foreseeable future actions, and reasonably foreseeable future actions at KSC and Cape Canaveral Space Force Station generally consist of construction and operations of space-related infrastructure and launches. The Proposed Action combined with current and future actions would result in minor to moderate cumulative impacts to land use/visual resources, biological resources, water resources, transportation, utilities, and hazardous materials and hazardous waste. Implementation of the Proposed Action or Alternative 1 is not anticipated to cause any significant cumulative impacts to the remaining local resource areas evaluated.

Table of Contents

Ex	ecutive Sumr	nary	ii
	Purpose an	d Need	ii
	Proposed A	.ction	iii
	Alternative	1	iii
	No Action A	Alternative	iii
	Summary o	f Potential Environmental Effects	iv
	Cumulative	Impacts	vi
1		Purpose and Need for the Proposed Action	1
	1.1.	Introduction	1
	1.2.	Location	1
	1.3.	Background	2
	1.4.	Federal Agency Roles	4
	1.5.	Purpose and Need	4
	1.6.	Public Involvement	5
	1.7.	Structure and Scope of the Environmental Assessment	5
2		Proposed Action and Alternatives	7
	2.1	Introduction and Background	7
	2.2	Proposed Action	7
	2.2.1	SpaceX Roberts Road Operations Area Expansion	7
	2.2.2	Saturn Causeway Improvements	10
	2.2.3	Utility Upgrade	11
	2.3	Alternative 1 – SpaceX Roberts Road Operations Area Expansion, South	
	Expansion	11	
	2.4	No Action Alternative	12
	2.5	Alternatives Considered but Dismissed	12
3		Affected Environment and Environmental Consequences	15
	3 1	Introduction	15
	3.1	Resources Considered but not Analyzed in Detail	15
	3.2	Region of Influence	10
	3.0	Land Lise /Visual Resources	17
	3.4	Affected Environment	17
	3 / 2	Environmental Consequences	<u>1</u> 7
	35	Biological Resources	21
	3.5	Affected Environment	21
	352	Environmental Consequences	21
	3.6	Cultural Resources	22
	3.0	Affected Environment	33
	3.0.1	Environmental Consequences	55
	3.7	Air Quality	35
	3. <i>7</i> 271	Affected Environment	55
	270	Environmental Consequences	36
	3.8	Climate	
	2.0		

3.9 3.10 3.11 3.12 3.13 4.1 4.2 5.1 5.2 5.5 5.5 5.5 5.5 5.5 5.5 5.5	5.2.9 5.2.10	Utilities Hazardous Materials and Hazardous Waste List of Preparers and Contributors	65 66 67
3.9 3.10 3.11 3.12 3.12 3.13 4.1 4.2 5.1 5.2 5.2 5.5 5.5 5.5 5.5 5.5 5.5	5.2.9 5.2.10	Utilities Hazardous Materials and Hazardous Waste	65 66
3.9 3.10 3.11 3.11 3.12 3.13 4.1 4.2 5.1 5.2 5.5 5.5 5.5 5.5 5.5 5.5 5.5	5.2.9	Utilities	65
3.9 3.10 3.10 3.11 3.12 3.13 4.1 4.2 5.1 5.2 5.2 5.2 5.5 5.5 5.5 5.5 5.5			00
3.9 3.10 3.11 3.12 3.13 3.13 4.1 4.2 5.1 5.2 5.5 5.5 5.5 5.5 5.5 5.5 5.5	5.2.8	Transportation	65
3.9 3.10 3.11 3.11 3.12 3.13 4.1 4.2 5.1 5.2 5.2 5.5 5.5 5.5 5.5 5.5 5.5	5.2.7	Geology and Soils	65
3.9 3.10 3.11 3.11 3.12 3.13 3.13 4.1 4.2 5.1 5.2 5.1 5.2 5.5 5.5 5.5 5.5 5.5 5.5 5.5	5.2.6	Water Resources	64
3.9 3.10 3.11 3.12 3.13 3.13 4.1 4.2 5.1 5.2 5.2 5.5 5.5 5.5 5.5 5.5 5.5	5.2.5	Climate	64
3.9 3.10 3.11 3.11 3.12 3.13 4.1 4.2 5.1 5.2 5.2 5.2 5.5	5.2.4	Air Quality	63
3.9 3.10 3.11 3.12 3.12 3.13 4.1 4.2 5.1 5.2 5.2 5.5	5.2.3	Cultural Resources	63
3.9 3.10 3.11 3.12 3.13 3.13 4.1 4.2 5.1 5.2 5.2	5.2.2	Biological Resources	62
3.9 3.10 3.11 3.12 3.12 3.13 4.1 4.2 5.1 5.2	5.2.1	Land Use/Visual Resources	61
3.9 3.10 3.11 3.12 3.12 3.13 4.1 4.2 5.1		Cumulative Impact Analysis	61
3.9 3.10 3.11 3.12 3.13 4.1 4.2		Projects Considered for Potential Cumulative Effects	55
3.9 3.10 3.11 3.12 3.12 3.13 4.1 4.2		Cumulative Impacts	54
3.9 3.10 3.11 3.12 3.13 3.13 4.1		Water Resources	52
3.9 3.10 3.11 3.11 3.12 3.13 3.13		Florida Scrub-Jay	52
3.9 3.10 3.11 3.12 3.12 3.13 3.13		Mitigation	52
3.9 3.10 3.11 3.11 3.12 3.12 3.13 3.13	3.13.2	Environmental Consequences	51
3.9 3.10 3.11 3.11 3.12 3.12 3.13	3.13.1	Affected Environment	50
3.9 3.10 3.11 3.11 3.12 3.12 3.12	}	Hazardous Materials and Hazardous Waste	50
3.9 3.10 3.11 3.11 3.11 3.12 3.12	3.12.2	Environmental Consequences	49
3.9 3.10 3.11 3.11 3.11 3.12	3.12.1	Affected Environment	47
3.9 3.10 3.11 3.11	<u>)</u>	Utilities	47
3.9 3.10 3.11 3.11	3.11.2	Environmental Consequences	46
3.9 3 3.10 3 3.11	3.11.1	Affected Environment	45
3.9 3 3.10 3		Transportation	44
3.9 3 3.10	3.10.2	Environmental Consequences	44
3.9 3 3 3.10	3.10.1	Affected Environment	44
3.9 3)	Geology and Soils	43
3.9 3	3.9.2	Environmental Consequences	40
3.9	3.9.1	Affected Environment	38
a a		Water Resources	37
3	3.8.2	Environmental Consequences	37
3	3.8.1	Affected Environment	37
-	<u>م</u>	3.8.1 3.8.2	 3.8.1 Affected Environment

Appendix A: Agency Consultations

List of Figures

Figure 1-1. Vicinity Map	2
Figure 2-1. Rendering of Existing SpaceX Roberts Road Operations Area under Construction looking Sout	:h8
Figure 2-2. Expansion Area Conceptual Site Plan	9
Figure 2-3. Saturn Causeway Widening	10
Figure 2-4. Saturn Causeway Widening Cross Section*	10
Figure 2-5. Alternative 1	12
Figure 2-6. SpaceX Roberts Road Operations Area Alternatives Dismissed	13
Figure 3-1. Land Use, Cover, and Forms at the SpaceX Roberts Road Operations Area	22
Figure 3-2. Florida Scrub Jay Potential Territories and Bald Eagle Nests	24
Figure 3-3. Water Resources at the SpaceX Roberts Road Operation Area	38
Figure 3-4. FEMA Flood Hazard Areas at the SpaceX Roberts Road Operations Area	39
Figure 3-5. FEMA Flood Hazard Areas at Saturn Causeway/LC-39A	40
List of Tables	

List of Tables

Table 2-1. Alternative Site Comparison	14
Table 3-1. Factors Used to Characterize Environmental Consequences of the Proposed Action, Alternative	1,
and No Action Alternative.	15
Table 3-2. Resources Considered but not Analyzed in Detail	16
Table 3-3. Regions of Influence	17
Table 3-4. Land Cover and Land Use within Project Footprint.	21
Table 3-5. Protected Wildlife Species with the Potential to Occur within the ROI	25
Table 3-6. Resources within Roberts Road Expansion APE	34
Table 3-7. Soil Types in Project Study Area	44
Table 3-8. AADT for Roadways Providing Access to KSC	45
Table 3-9. Projected 2027 Level of Service	47
Table 5-1. Cumulative Actions with Temporary Construction Impacts	55
Table 5-2. Cumulative Action Evaluation	56
Table 6-1. Preparers of the SEA	67

Acronyms and Abbreviations

AADT	annual average daily traffic	LLF	Launch and Landing Facility
BA	Biological Assessment		Merritt Island National Wildlife
BMP	best management practices	IVI IN VV K	Refuge
BO	Biological Opinion	mph	miles per hour
00050	Cape Canaveral Space Force	MW	megawatt
CCSFS	Station		National Ambient Air Quality
CEQ	Council on Environmental Quality	NAAQS	Standards
C.F.R.	Code of Federal Regulations		National Aeronautics and Space
	Cultural Resources Assessment	NASA	Administration
CRAS	Survey	NEPA	National Environmental Policy Act
CSLA	Commercial Space Launch Act	NHPA	National Historic Preservation Act
CWA	Clean Water Act		National Polluntant Discharge
CZMA	Coastal Zone Management Act	NPDES	Ellimination System
EA	Environmental Assessment	NPR	NASA Procedural Requirement
EO	Executive Order		National Register of Historic
500	Environmental Resources	NKHP	Places
ERD	Document	DEIC	Programmatic Environmental
EUL	Enhanced Use Lease	PEIS	Impact Statement
FAA	Federal Aviation Administration	ROI	Region of Influence
FAC	Florida Administrative Code		St. Johns River Water
	Florida Department of	SJRWIVID	Management District
FDEP	Environmental Protection	SLC	Space Launch Complex
FDOT	Florida Department of	SLS	Space Launch System
FDUT	Transportation	Concern V	Space Exploration Technologies
	Federal Emergency Management	Spacex	Corp.
FEIVIA	Agency	SR	State Route
FLUCFCS	Florida Land Use, Cover and	CIMPOD	Stormwater Pollution Prevention
	Forms Classification Sheet	SWPPP	Plan
FPL	Florida Power and Light	U.S.C.	United States Code
FSJ	Florida scrub-jay		Uniform Mitigation Assessment
GHG	greenhouse gas		Method
	Integrated Cultural Resources	LISACE	United States Army Corps of
ICRIVIP	Management Plan	USACE	Engineers
	Intergovernmental Panel on	ΙΙςέρδ	United States Environmental
IPCC	Climate Change	002171	Protection Agency
KSC	Kennedy Space Center	LISEW/S	United States Fish and Wildlife
LC	Launch Complex	00.000	Service
LID	Low-Impact Development		

1 Purpose and Need for the Proposed Action

1.1. Introduction

In this Supplemental Environmental Assessment (SEA), the National Aeronautics and Space Administration (NASA) is evaluating Space Exploration Technologies Corp.'s (SpaceX's) proposed expansion of its facilities on Roberts Road at Kennedy Space Center (KSC), for the purpose of consolidating its operations in Brevard County, FL and constructing infrastructure improvement projects on KSC to support operations. SpaceX currently leases 67 acres from NASA on Roberts Road where it has built facilities and conducts rocket processing and refurbishment ("SpaceX Roberts Road Operations Area"). SpaceX now seeks to lease an additional 100 acres from NASA ("Expansion Area"). SpaceX must enter into and execute a real property agreement with NASA for this expansion. NASA's execution of a real property agreement in support of SpaceX's Proposed Action is considered a major federal action under the National Environmental Policy Act (NEPA) of 1969, as amended (42 United States Code [U.S.C.] 4321, et seq.) and requires an environmental review. NASA is the lead federal agency for this environmental review, and it was prepared pursuant to the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 Code of Federal Regulations [C.F.R.] parts 1500-1508), NASA regulations for implementing NEPA (14 C.F.R. Subpart 1216.3), and the NASA Procedural Requirement (NPR) for Implementing NEPA and Executive Order (EO) 12114 (NPR 8580.1).

1.2. Location

NASA was created in 1958 to lead the nation's civilian space exploration and aeronautical technology development activities and began acquiring property to be used as a base for launch operations in support of the Manned Lunar Landing Program in 1962. A Launch Operations Center, later known as KSC, was established in Merritt Island, Florida. KSC, located in Florida within Brevard and Volusia counties, is comprised of approximately 139,436 acres and is situated along the Atlantic east coast approximately 150 miles south of Jacksonville, 200 miles north of Miami, and 40 miles east of Orlando (Figure 1-1). KSC is the nation's primary federal spaceport for government and commercial access to space. From 1981 to 2011, KSC was responsible for ground processing, launch, and landing activities for the Space Shuttle Program. Since 2011, KSC has developed partnerships with governmental entities and commercial operators and made its unique assets, capabilities, and expertise available for use. KSC has transitioned from a government-only space launch complex to a public-private space gateway that facilitates the largest concentration of space launch operators in the world.



Source: NASA 2020a

1.3. Background

NASA encourages the use of KSC property by other governmental agencies, commercial space and related industries, and universities through real property agreements. NASA is leasing multiple KSC facilities and land for a variety of space programs that support the agency and advance the commercial space industry, secondary support industries, and universities. Current property agreements at KSC include, but are not limited to, SpaceX's processing and launch of Falcon vehicles at Launch Complex (LC)-39A, Space Florida's operation of the Launch and Landing Facility (LLF; formerly known as the Shuttle Landing Facility), the

Florida Power and Light (FPL) photovoltaic facilities, Boeing's use, through Space Florida, of the former Orbiter Processing Facility 3 for the CST-100 Starliner, and the Blue Origin Manufacturing Facilities in Exploration Park.

The November 2016 Programmatic Environmental Impact Statement (PEIS) for the KSC Master Plan describes the current environmental setting and long-range planning for KSC. The KSC PEIS was prepared to: (i) evaluate potential environmental impacts from operations, activities and facilities across KSC as a whole; (ii) consider scenarios for repurposing existing facilities; (iii) reorganize management of KSC and its land resources; and (iv) continue partnerships with government organizations and commercial entities. Programmatic NEPA documents such as the KSC PEIS are broad in scope and may be followed by more site-specific or action-specific documents, as appropriate. This is described as tiering, with focused documents (such as this SEA) that reference back to broader documents that elaborate in more detail (such as the PEIS). Consistent with this approach, this SEA focuses on the issues specific to the Proposed Action described herein, and the PEIS is incorporated by reference, where applicable.

In 2018, SpaceX and NASA prepared the *Final Environmental Assessment for Space Exploration Technologies Operations Area on Kennedy Space Center* (NASA, 2018a), referred to as 2018 EA for the purpose of this document, to evaluate the potential environmental impacts of construction and operation of the SpaceX Roberts Road Operations Area. NASA issued a Finding of No Significant Impact (FONSI) in December 2018. The 2018 EA included a launch and landing control center of approximately 32,000 square feet with a maximum height of 300 feet, a 133,000 square foot hangar with a maximum height of 100 feet for booster and fairing processing, a 32,000 square foot rocket decommissioning facility, a 1,000 square foot rocket hardware storage facility, a security office of 2,500 square feet, a 280,000 square foot utilities yard with a wastewater lift station and/or treatment plant, road improvements, and a rocket garden with Dragon or Falcon 9 vehicles staged horizontally or vertically (up to approximately 300 feet). Since the FONSI, SpaceX has constructed Hangar X, which provides office space and booster and fairing processing and storage, parking lots, and associated utilities. Pursuant to the 2018 EA, SpaceX is currently constructing a Hangar X expansion, and other storage and processing facilities within the existing SpaceX Roberts Road Operations Area.

In 2020, NASA published the KSC Vision Plan and Programmatic EA. The Vision Plan is the first stage of a 2020 Master Plan update, which will serve as a framework for stewarding KSC's physical assets over the next 20 years. This foundational step, developed through collaboration with stakeholders within NASA and federal, state, and local governments, and commercial entities, will guide the development of the 2020 Master Plan update, prioritizing mission and institutional alignment, affordability, sustainability, and launch throughput, in accordance with relevant policy and guidance. The KSC Vision Plan aims to meet NASA's missions while maximizing opportunities for non-NASA stakeholders to develop and grow additional resources and capabilities at KSC. The KSC Vision Plan divides KSC into seven planning districts to focus follow-on planning efforts. The existing SpaceX Roberts Road Operations Area and Proposed Action are within the Space Commerce District defined in the KSC Vision Plan, the goal of which is to provide support to commercial industry.

1.4. Federal Agency Roles

This SEA was prepared by SpaceX, as the proponent of the Proposed Action, under the supervision of NASA as the lead federal agency. As the landowner, NASA is responsible for managing areas on KSC for space-related development and operations and provides oversight for non-NASA space and technology development use of KSC property. KSC is responsible for establishing and coordinating appropriate use agreements and operating procedures for those activities outlined in the Proposed Action.

NASA has requested the United States Fish and Wildlife Service (USFWS) Merritt Island National Wildlife Refuge (MINWR) participate in the NEPA process as a participating agency due to their special expertise and management responsibilities for land potentially affected by the activities evaluated in this SEA. Through official agreement with NASA (KCA-1649 Rev. B), the USFWS manages KSC lands not specifically used for space-related operations as MINWR.

1.5. Purpose and Need

The purpose of NASA's action is to fulfill its mandate to encourage the fullest commercial use of space, advances NASA's mission to foster a commercial space launch and services industry, and improves the return on taxpayer investment in KSC spaceport facilities through expanded and improved utilization. NASA's execution of real property agreements for use of KSC by other governmental agencies, commercial space and related industries, and universities fulfills this mandate and furthers the goals of KSC long-term planning initiatives and NASA programmatic objectives, and ultimately increases American competitiveness in commercial space. NASA's action fulfills the KSC Master Plan objective to "foster and support the fullest commercial use of space," and is consistent with national directives outlined in the Commercial Space Launch Act, the National Space Policy, and the National Space Launch Policy. Commercial use of KSC real property supports NASA's mandate to encourage the fullest commercial use of space, supports the goals of the National Aeronautics and Space Act, and advances the National Space Policy that federal agencies shall ensure that U.S. Government space technology and infrastructure is made available for commercial use on a reimbursable, noninterference, and equitable basis

The purpose of SpaceX's proposal is to increase the capabilities, efficiency, and cost effectiveness of SpaceX's production and launch support operations in Brevard County, Florida. Consolidation of operations would allow SpaceX to reduce the time it takes to produce, launch, and refurbish rockets to meet the growing demand for launch services from the U.S. government, allied foreign governments, and commercial customers. Demand for launch services has continued to increase over the past 10 years, and the space industry growth projections indicate this will continue into the foreseeable future. SpaceX is launching at an average of nearly twice a week and has over 100 missions on its manifest in 2023 - most of those missions are from Cape Canaveral Space Force Station (CCSFS) and KSC. To meet the additional and growing demand of the U.S. government, allied foreign governments, and commercial customers, and to accomplish SpaceX's goal of streamlining operations and increasing cadence, SpaceX needs additional land in proximity to where it already has facilities and to construct supporting infrastructure at KSC¹.

¹ Upon further evaluation, operations at this time do not require construction of an approximately 2.2-mile road from NASA Parkway to the SpaceX Roberts Road Operation Area and is not in the reasonably foreseeable future.

1.6. Public Involvement

NASA is using multiple methods of stakeholder engagement and public outreach to solicit comments and feedback regarding SpaceX's proposal. NASA published a project website ² in June 2022 notifying interested parties that NASA was in the beginning stages of conducting an environmental review for SpaceX's proposal.

NASA initiated a 30-day comment period for public scoping on June 29, 2022. A notification was sent to the project email distribution list and a presentation was provided on the project website. A total of 47 comments were received during the public scoping period, and where applicable, have been incorporated into this SEA. Positive impacts raised by commenters included: economic benefits to the regional economy; continued innovation and progress in commercial space transportation; benefits of reusable launch vehicles; and job creation. Concerns raised by commenters included: potential impacts to the Indian River Lagoon, protected species and habitat, MINWR, wetlands, wastewater system and utilities, and fire management activities; location of wetland mitigation; the need for the NASA Parkway Connector; and potential cumulative impacts of the proposed project and other development at KSC. A number of comments received were related to the launch of Starship-Super Heavy at KSC or CCSFS, which is outside the scope of the Proposed Action.

1.7. Structure and Scope of the Environmental Assessment

This SEA presents the analysis and description of potential environmental impacts that could result from the Proposed Action, Alternative 1, and No Action Alternative. As appropriate, the affected environment and environmental consequences of the Proposed Action and the No Action Alternative are discussed in context with resource area descriptions. Section 2 of the SEA describes the Proposed Action, the No Action Alternative, and Alternatives Considered but Eliminated from Detailed Analysis. Section 3 describes the affected environmental resources and the potential impacts of the Proposed Action and No Action Alternative on those resources. The resources analyzed in detail are:

- Land Use/Visual Resources
- Biological Resources
- Cultural Resources
- Air Quality
- Climate
- Water Resources
- Geology and Soils
- Transportation
- Utilities
- Hazardous Materials and Hazardous Waste

² <u>https://environmental.ksc.nasa.gov/EnvironmentalPlanning/starshipsuperheavy</u>

Resources that were sufficiently analyzed in prior NEPA documents and determined to have no significant environmental impact were dismissed from analysis. These include noise, health and safety, socioeconomics, and environmental justice.

Section 4 describes mitigation that would be implemented under the Proposed Action. Section 5 describes cumulative impacts on the resource areas from other similar past, present, and reasonably foreseeable future actions. Section 6 presents a list of those who prepared the EA. Section 7 lists references cited in this SEA.

2 Proposed Action and Alternatives

2.1 Introduction and Background

This section provides information regarding the Proposed Action, Alternative 1, and No Action Alternative. It also provides a description of alternatives that were considered but eliminated from detailed review.

NASA's Proposed Action is to amend the existing Enhanced Use Lease for the Roberts Road Operational area (EUL) between NASA and SpaceX for the Proposed Action. A land use change from Operational Buffer/Conservation to Launch Operations and Support would be required at Roberts Road. SpaceX would be required to submit a site plan for the land use change request, which NASA would evaluate through the Master Plan Amendment Process. Following approval of the Master Plan Amendment, execution of the EUL and land use change, and acquisition of permits, SpaceX would be able to proceed with planned improvements as described below.

2.2 Proposed Action

NASA's proposed federal action is to transfer, by real property agreement, land at KSC to SpaceX for the expansion of its Roberts Road Operations Area and construct supporting infrastructure improvements. NASA would amend existing EULs with SpaceX to complete the property transfer.

SpaceX's proposed action is the expansion of its Roberts Road Operations Area, upgrade of utilities, and widening Saturn Causeway to support vehicle transport from the SpaceX Roberts Road Operations Area to and from launch facilities.

2.2.1 SpaceX Roberts Road Operations Area Expansion

Under the Proposed Action, SpaceX would lease approximately 100 acres of land north of the existing SpaceX Roberts Road Operations Area for the development of additional office space and industrial facilities in support of vehicle and payload processing, fabrication, storage, manufacturing, and shipping and receiving—see proposed site layout in Figure 2-2 ("Expansion Area"). As shown in Figure 2-2, SpaceX would construct facilities and a new parking area to support these uses. The total footprint of the facilities within the Expansion Area would not exceed 1.5 million square feet, and facility height would not exceed approximately 400 feet. Internal site roads would provide access and connectivity to facilities within the site boundary. Given the proximity of the proposed facilities to the LLF and the CCSFS Skid Strip, SpaceX would conduct an airspace analysis in accordance with 14 C.F.R. Part 77. SpaceX would also file and comply with Federal Aviation Administration (FAA) Form 7460-1, Notice of Proposed Construction or Alteration.

Figure 2-1. Rendering of Existing SpaceX Roberts Road Operations Area under Construction looking South



SpaceX has invested heavily into facilities at KSC and consolidation would allow operations to be streamlined, which reduces turn-around-time between launches. As the site develops, employees and operations would begin to consolidate at the SpaceX Roberts Road Operations Area, where the majority of employees would primarily be located. SpaceX is planning to cease operations at Hangar AO on CCSFS in 2024. At this time, other SpaceX facilities at KSC and CCSFS would be retained. Construction would last approximately two to three years, and the site would be occupied for the foreseeable future upon construction completion.

Under the Proposed Action, SpaceX would expand fiber communications connectivity, water, and wastewater utilities to the new facilities from the existing SpaceX Roberts Road Operations Area. FPL would provide power via new underground feeders that would run from FPL's planned Saturn Substation,³ south along Kennedy Parkway or within the existing transmission easement, west along Schwartz Road, and south along Avenue A. The underground lines are anticipated to be within the existing transportation facility. SpaceX expects to need an additional 10-megawatt (MW) service at the site to supplement the 10 MW service already in place. FPL's power project is not a SpaceX action and thus analyzed only for cumulative impacts in this SEA. As site facilities are built, SpaceX would construct improvements at the intersection of Kennedy Parkway and Roberts Road, including signalization, to maintain acceptable traffic conditions. These intersection improvements are expected to be within the existing transportation facility.

³ The FPL Saturn substation has been permitted and construction is anticipated to begin in 2023.



Figure 2-2. Expansion Area Conceptual Site Plan

2.2.2 Saturn Causeway Improvements

SpaceX proposes to widen Saturn Causeway from the Vehicle Assembly Building to Phillips Parkway, approximately 3.9 miles, to support launch vehicle transport (Figure 2-3). Saturn Causeway would be widened approximately 8 feet, from approximately 26 feet to approximately 34 feet, and drainage swales would be improved. A typical section of this improvement with a drainage swale is shown in Figure 2-4. Construction would occur within the maintained area along the southern side of the road.



Figure 2-3. Saturn Causeway Widening

Figure 2-4. Saturn Causeway Widening Cross Section*



*Exact cross section varies by location

2.2.3 Utility Upgrade

SpaceX proposes to construct a new utility duct bank, approximately 4.2 miles, within the Saturn Causeway widening construction boundary and previously disturbed areas between the Vehicle Assembly Building and the C5 substation east of the Vehicle Assembly Building to support operations at the launch pad. As shown in Figure 2-4, the proposed duct bank would generally be located beneath the grass shoulder and/or swale of Saturn Causeway.

2.3 Alternative 1 – SpaceX Roberts Road Operations Area Expansion, South Expansion

Under Alternative 1, SpaceX would expand the SpaceX Roberts Road Operations Area to the south of Roberts Road, shown in Figure 2-5. Alternative 1 would require approximately 115 acres due to the proximity of the FPL solar farm and transmission lines. A 100-acre site identical to the Proposed Action is not possible due to these neighboring features, thus additional land is needed to support the same type of operations. Building composition would be similar to the Proposed Action, but building size may be different due to the different dimensions of the site boundary. Site construction and development of Alternative 1 would also require construction of new utility farms and the extension of existing utilities to cross Roberts Road, including but not limited to a new pneumatic gas farm or several thousand feet of high-pressure gas lines, a second set of transformers and electrical feeders, a second wastewater lift station, sanitary sewer network, new connections to KSC's sanitary sewer network, and construction of an additional NASA demarcation point for communication equipment. The widening of Saturn Causeway and utility upgrade would be also be constructed under this alternative.



2.4 No Action Alternative

Under the No Action Alternative, the existing EUL between NASA and SpaceX would not be amended, expansion of the Roberts Road Operations Area would not occur beyond what is currently authorized, and SpaceX would not further consolidate its operational footprint on KSC. SpaceX's operations in Brevard County would continue; however, they would occur at disjunct facilities. Saturn Causeway widening and utility upgrades would not occur. SpaceX's ability to provide more efficient, low-cost, reliable access to and from space would not be realized. The No Action Alternative would not meet the Purpose and Need.

2.5 Alternatives Considered but Dismissed

As explained in Section 1.5, the purpose of SpaceX's proposal is to increase capabilities, efficiency, and cost effectiveness of SpaceX's production and launch support operations in Brevard County, Florida by consolidating as many of these operations as possible. SpaceX has invested heavily into facilities at the SpaceX Roberts Road Operations Area at KSC, and a consolidation of operations at this site would meet the purpose of increasing SpaceX capabilities, efficiency, and cost effectiveness of production and launch support operations. Alternatives outside of KSC would require additional land, substantial additional capital expenditures, and would introduce additional challenges in transporting flight hardware to and from KSC across public routes. As such, alternatives not located on KSC were dismissed from further review as they would not meet the Purpose and Need.

At the request of NASA, SpaceX evaluated two additional alternative sites for Expansion Area: Alternative 2 (intersection of Schwartz Rd and A Avenue), and Alternative 3 (East of A Avenue); see Figure 2-6.



Figure 2-6. SpaceX Roberts Road Operations Area Alternatives Dismissed

The relocation of A Avenue would result in additional environmental impacts, as it would be located predominantly in the wetlands west and north of the SpaceX Roberts Road Operations Area. Additionally, Schwartz Road would need to be widened from a new intersection of A Avenue to old A Avenue to support vehicle transport. Accordingly, the relocation of A Avenue is not practicable.

Alternative 2 would require the routine transfer of hardware and personnel along Schwartz Road and A Avenue. This scenario is similar to what SpaceX operations look like at present with facilities fragmented across KSC. Further, daily operations, which would include transport of large hardware and personnel between the existing SpaceX Roberts Road Operations Area and the Expansion Area at Alternatives 2 or 3 would have the potential to routinely restrict access on Roberts Road, A Avenue, and Schwartz Road.

Alternative 3 would result in the routine transfer of large hardware and personnel across A Avenue respectively, which could reduce efficiency of SpaceX operations. This transfer of hardware and personnel would introduce conflict points between vehicular traffic and SpaceX personnel crossing Roberts Road and A Avenue during operations. SpaceX expects these alternatives would require multiple road crossings per day for tooling and flight hardware. Alternative 3 would restrict building and site layout due to the proximity of the high-voltage transmission lines. The oldest bald eagle nest at KSC, rebuilt in 2023 after storm damage, is also located within the Alternative 3 boundary.

Development of Alternative 2 or Alternative 3 would require additional impacts to construct new utility farms and a greater extension of existing utilities compared to the Proposed Action, which would utilize

existing utility tie-ins. Required utility construction under Alternative 2 or Alternative 3 would include a new pneumatic gas farm or several thousand feet of high pressure gas lines, a second set of transformers and electrical feeders, a second wastewater lift station, sanitary sewer network, new connections to KSC's sanitary sewer network, and construction of an additional NASA demarcation point for communication equipment.

Alternative 2 and 3 would result in a payload processing facility being sited closer to Kennedy Parkway. This could have the potential to impact Kennedy Parkway during hazardous operations due to clears required to be in place⁴, but would be payload and weather specific. As discussed in the 2018 EA, the location of the SpaceX Roberts Road Operations Area was selected due to its isolation from other NASA facilities and operations eliminating issues with quantity distance arcs and buffers and lower hazard risks to KSC personnel and operations.

A summary of operational and environmental site constraints for Alternatives 2 and 3 are included in Table 2-1. Due to these constraints and potential impacts, Alternative 2 and 3 were not considered practicable and not carried forward for detailed analysis.

Site	Site Constraints		
Proposed Action	- No constraints		
Alternative 1	- Additional wetland impacts compared to Proposed Action		
	- Requires new utilities construction		
	- Payload processing facility proximity to FPL solar farm, Kennedy Parkway, and		
	NASA Parkway		
Alternative 2	- Non-contiguous campus		
	 NASA tracking station would need to be relocated 		
	- Payload processing facility proximity to Kennedy Parkway		
Alternative 3	- Proximity to transmission lines		
	- Impacts rebuilt nest of oldest bald eagle nest at KSC		
	- Payload processing facility proximity to Kennedy Parkway		

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⁴ Clear distances are based on quantity distance arcs which are used to determine the siting of potentially explosive material. Toxic hazard corridors are predicted atmospheric dispersion paths of hazardous materials and are used to reduce the exposure risk to personnel and the general public.

3 Affected Environment and Environmental Consequences

3.1 Introduction

This section provides a description of the existing environment that could be affected by the Proposed Action at KSC, followed by an analysis of potential environmental impacts of the Proposed Action. This SEA identifies changes to the affected environment since the 2018 EA was published (see Section 1.3 [Background]). The 2018 EA described existing conditions and practices at the SpaceX Roberts Road Operations Area and addressed impacts associated with infrastructure development activities. Where this information remains the same, this SEA does not repeat it. Also, this SEA does not address some resource areas that were included in the 2018 EA. Section 3.2 below explains the rationale for not including those resource areas that were analyzed in the 2018 EA.

The factors used to evaluate the potential impacts associated with the Proposed Action are described in Table 3-1. These include type, duration, extent, magnitude, and likelihood of an impact.

Factor	Туре		
	Beneficial – positive effect to the resource		
	Adverse – undesirable or negative effect to the resource		
	Direct – effect caused at the same time and place as action		
Туре	Indirect – effect caused later in time or at a farther distance from action, but is		
	still reasonably foreseeable		
	Cumulative – effect caused from incremental impact of the proposed action		
	when added to past, present, and reasonably foreseeable future actions		
	Long Term – effect would last longer than two years and is not related to		
Duration	specific phase (e.g. construction)		
Duration	Short Term – effect would occur for a limited time frame (e.g. during		
	construction only)		
	Large – effect would occur over a large region, well past project site		
Extent	Medium/Localized – effect would be limited to project site		
	Small or Limited – effect would be limited to a fraction of the project site		
	Major – substantial effect or change that is easily defined, noticeable, and		
	measurable, or exceeds a standard		
	Moderate – noticeable change in resource occurs, but the integrity of resource		
Magnitude	stays intact		
Wagintuue	Minor – change in resource occurs, but effect is unsubstantial		
	Negligible – effect is at lowest level of detection, is barely measurable and has		
	no perceptible consequences		
	None – no measurable consequences		
	Probable – more likely to occur than not		
Likelihood	Possible – some chance of occurring but less than 50 percent		
	Unlikely – very low chance of occurrence		

 Table 3-1. Factors Used to Characterize Environmental Consequences of the Proposed Action,

 Alternative 1, and No Action Alternative.

This SEA examines the environmental impacts of the Proposed Action, Alternative 1, and No Action alternatives on the following resource areas: land use/visual resources, biological resources, cultural resources, air quality, climate, water resources, geology and soils, transportation, and utilities.

NASA's NEPA policy requires NASA Centers to maintain an Environmental Resources Document (ERD) that provides a detailed description of environmental resources and related permits. There is a complete description of all resource areas in the 2020 ERD for KSC (NASA, 2020b).

3.2 Resources Considered but not Analyzed in Detail

The discussion of the affected environment (i.e., existing conditions) focuses only on those resource areas potentially subject to moderate or major impacts. The potential impacts on the resource areas in Table 3-2 are considered negligible or non-existent so they were considered but not carried forward or analyzed in detail in this SEA. The level of detail used in describing a resource is commensurate with the anticipated level of potential environmental impact.

Resource Area	Rationale
Noise	The noise environment and potential noise-related impacts from development activities remain the same as described in the 2018 EA. Noise impacts under the Proposed Action or Alternative 1 would be minimal. Short-term increases in noise would result from the use of heavy equipment during construction. Long-term effects from traffic and daily industrial operations would be consistent with ongoing activities.
Health and Safety	Health and safety policies and programs identified in the 2018 EA would continue to be implemented. To provide for the health and safety of workers and visitors who may be exposed to hazards during construction and consistent with the 2018 EA, federal Occupational Safety and Hazard Administration regulations would be implemented, and health and safety plans specific to the proposed expansion would be developed and implemented. In addition, awareness training would be incorporated into the worker health and safety protocol. Adverse health and safety impacts under the Proposed Action or Alternative 1 are not expected.
Socioeconomics	The Proposed Action would result in approximately 300 additional employees, which could result in a moderate, beneficial impact. This increase would not result in meaningful deviation from impacts identified in the 2018 EA. Short-term employment benefits would be anticipated during the construction timeframes. Socioeconomic impacts under the Proposed Action or Alternative 1 would be minimal.
Environmental Justice	The environmental justice community is the same as described in the 2018 EA and thus, no change would occur with the Proposed Action. The Proposed Action or Alternative 1 would not result in environmental justice impacts.

Table 3-2. Resources Considered but not Analyzed in Detail

EA = Environmental Assessment; KSC = Kennedy Space Center; NASA = National Aeronautics and Space Administration; SpaceX = Space Exploration Technologies Corp

3.3 Region of Influence

The region of influence (ROI), or study area, varies based on the environmental impact category being analyzed and is defined for each environmental impact category in Table 3-3. The ROI for resources areas is generally KSC-at large or the footprint of the area directly impacted, consistent with KSC's approach to center-wide planning as discussed in the 2016 PEIS, KSC Vision Plan, and KSC Master Plan.

Resource Area	Region of Influence		
Land Use/Visual Resources	KSC		
Biological Resources	KSC		
Cultural Resources	Archaeology: Expansion area footprint		
	Architecture: Expansion area footprint and one-mile buffer		
Air Quality	Brevard County		
Climate	East-central Florida region		
Water Resources	KSC		
Geology and Soils	Expansion area footprint		
Transportation	KSC		
Utilities	KSC		
Hazardous Materials and	KSC		
Hazardous Waste			

Table 3-3. Regions of Influence

KSC = Kennedy Space Center

3.4 Land Use/Visual Resources

Land use can be defined as the human use of land resources for various purposes including economic production, natural resources protection, or institutional uses. Land uses are frequently regulated by mission objectives, program and project plans, policies, ordinances, and regulations that determine the types of uses that are allowable or protect designated or environmentally sensitive land. The Proposed Action site is governed by NASA land use policies and federal and state regulations, as applicable.

Visual resources are defined as the natural and man-made features that give an area its aesthetic qualities. These features define the landscape character of an area and form the overall impression received by an observer of the property. Visual resources include the natural and built features of the landscape visible from public views that contribute to an area's visual quality. The ROI for land use and visual resources is KSC at-large.

3.4.1 Affected Environment

3.4.1.1 Land Use

Changes to the Region of Influence (ROI) since the 2018 EA

Overall, land use categories and land use management on KSC have not changed since the 2018 EA. The total acreage of KSC has been slightly revised, from 141,831 acres to 139,436 acres (NASA, 2020b). NASA maintains operational control over approximately 5,424 acres, with the remaining area managed by the

USFWS MINWR and the National Park Service (Canaveral National Seashore). USFWS is responsible for prescribed burning within the MINWR.

Land use changes have been associated with a small number of construction projects on KSC property since 2018. A photovoltaic facility was constructed adjacent to the existing SpaceX Roberts Road Operations Area (NASA, 2018b). Placement of the photovoltaic facility required a change in land use designation for a small area from Operational Buffer/Conservation to Renewable Energy. Construction of the SpaceX Roberts Road Operational Area required a change in land use designation from renewable energy to launch operations and support. Construction of the SpaceX Roberts Road Operational Area is underway.

3.4.1.2 Visual Resources

Changes to the ROI since the 2018 EA

The ROI for visual resources includes the viewshed around the Proposed Action, such as adjacent lands within view of facilities. Overall, the viewshed of KSC has not changed substantially since completion of the 2018 EA. However, the immediate vicinity of the Proposed Action has changed due to the construction of the SpaceX Roberts Road Operations Area as described in Section 1.3. These changes include construction of Hangar X, a parking lot, and utilities yard. An expansion of Hangar X, a manufacturing facility, and high bay are currently under construction. Outside of the SpaceX Roberts Road Operations Area, construction of the photovoltaic facility immediately adjacent to the SpaceX Operations Area was completed. At LC-39A, SpaceX has constructed an approximately 500-foot tall integration tower for its Starship/Super Heavy launch system.

3.4.1.3 Coastal Zone

Changes to the ROI since the 2018 EA

In the context of the Coastal Zone Management Act (CZMA), there have been no changes to Florida's coastal zone since the 2018 EA. The coastal zone consists of the entire state and its territorial seas. Florida's statewide coastal management program, executed by the Florida Department of Environmental Protection (FDEP), is based on a network of agencies implementing 24 statutes protecting coastal resources. Any activities directly affecting the coastal zone are subject to a determination of consistency with the state's Coastal Management Program (15 C.F.R. 930.30-44). NASA is required to review their activities with regard to direct effects on the coastal zone and is responsible for making final coastal zone consistency determinations.

3.4.2 Environmental Consequences

The location and extent of the Proposed Action and Alternatives were evaluated for potential effects on physical project site and adjacent land uses. Factors affecting land use include compatibility with on-site and adjacent land uses, restrictions on public access to land, or changes in an existing land use that is valued by the community. Other considerations are given to proximity to the Proposed Action and Alternatives, the duration of proposed activities, and their permanence.

The evaluation of visual resources in the context of environmental analysis addresses the contrast between visible landscape elements. Collectively, these elements comprise the aesthetic environment, or

landscape character. The landscape character is compared to the Proposed Action's visual qualities to determine the compatibility or contrast resulting from the development activities associated with the Proposed Action.

3.4.2.1 Land Use/Visual Resources – Proposed Action

Development of the land associated with the SpaceX Roberts Road expansion would occur within the Space Commerce District, but outside of the Spaceport Growth Boundary. The purpose of the Space Commerce District defined in the KSC Vision Plan is to provide support to commercial industry. Locations outside the Spaceport Growth Boundary are considered undevelopable area due to one or more development constraints (NASA, 2020a). Assuming NASA approval of the boundary re-designation, development of land for the Proposed Action would require a land use change from Operational Buffer/Conservation to Launch Operations and Support, which includes facilities and associated areas essential to supporting launch and flight missions, as well as propellant and munitions storage. SpaceX is proposing to utilize Division 1.4 ordnance at the proposed payload processing facility, similar to what is done at the CCSFS payload processing facility. Division 1.4 ordnance consists of explosives that present a minor explosion hazard, the explosive effects are largely confined to the package, and no projection of fragments of appreciable size or range is to be expected. SpaceX would develop a site plan in support of a land use change request, which NASA would evaluate through the Master Plan Amendment Process. If the Master Plan Amendment is approved, NASA would modify SpaceX's EUL to include the Proposed Action and subsequent land use changes. Additionally, any proposed site plan would be vetted through the KSC explosive siting process. There would be no land use change needed for construction along Saturn Causeway or LC-39A.

If developed, land associated with the Roberts Road expansion would no longer be part of the MINWR and would therefore not be available to the USFWS for prescribed burning operations (see Biological Resources, Section 3.4 for additional details regarding prescribed burn coordination). However, SpaceX would clear and maintain a 30.5 meter (100 feet) wide buffer around the north and west sides of the site boundary as defensible fire space ("Fire Buffer"). In addition, the buffer would enable USFWS management of adjacent land via prescribed burns, while also protecting SpaceX assets. Additionally, facilities would be designed to accommodate the potential for smoke being placed on buildings. The Proposed Action would not adversely impact KSC's ability to conduct prescribed burns, as discussed further in Section 3.4.2.4.

SpaceX and NASA consider the extent to which any lighting or other visual impacts associated with an action would create an annoyance to people or interfere with their normal activities. Potential visual impacts on the landscape in the vicinity of the Proposed Action include light emissions and facilities and other structures that interfere with the view of natural surroundings or otherwise change the visual aesthetic quality of the area.

Existing light sources at KSC include nighttime security lighting at the launch complexes and buildings. Lighting at the SpaceX Roberts Road Operations Area consists of nighttime security lighting and lighting in parking areas. Night-time security lighting at the new facilities would be installed and operated according to KSC's guidelines for exterior lighting, outlined in Chapter 24 of KNPR 8500.1, Rev. E (NASA, 2022a) and KSC-PLN-1210, Rev A. This includes development and implementation of a Lighting Operations Manual.

As described in the 2018 EA, existing conditions at KSC are characterized as having low visual sensitivity because the site is currently an industrialized area that supports space production and launches. Notable tall structures at KSC include lightning towers that are 528 feet tall, the Vehicle Assembly Building, and the Visitor Complex Space Shuttle Atlantis External Tank and Solid Rocket Booster Display. More broadly, the visual landscape at KSC is typical of an administrative and industrial campus, including hangars, fueling facilities, and payload and launch vehicle processing facilities. Although the Proposed Action would involve construction of structures that are up to 400 feet and visible outside of the immediate area, this is consistent with existing infrastructure at KSC and at the existing SpaceX Roberts Road Operations Area, which includes the 100-foot Hangar X, 100-foot support building under construction, and previously approved 300-foot launch and landing control center.

Prior to construction, SpaceX would submit a site plan to NASA with additional details on building dimensions and site layout. The KSC site plan review process identifies potential constraints including land use, operational conflicts, natural resources, line-of-sight, safety, and security, and ensures that the SpaceX plan complies with this SEA. SpaceX would implement changes as required by NASA.

Overall, based on the discussion above, the Proposed Action would result in direct long term, moderate, adverse impacts to the land use and visual resources at KSC due to the duration of the real property agreement between NASA and SpaceX. However, these impacts are either consistent with existing infrastructure and aesthetic environment at KSC, consistent with other land use in the area, or will be managed through conservation measures, such as a defensible fire space and lighting plan. Accordingly, impacts would not be significant.

3.4.2.2 Land Use/Visual Resources – Alternative 1

Impacts to land use and visual resources would be similar to those under the Proposed Action. The Alternative 1 site expansion is located outside the Spaceport Growth Boundary and would require a Master Plan Amendment, similar to that described above for the Proposed Action.

3.4.2.3 Land Use/Visual Resources – No Action Alternative

Under the No Action Alternative, there would be no new facilities or construction beyond what is currently authorized in the 2018 EA, or re-designation of land use or the Spaceport Growth Boundary. Therefore, there would be no project-related impacts to land use or visual resources.

3.4.2.4 Coastal Zone – Proposed Action

The Proposed Action would result in short-term, direct, minor impacts to the coastal zone. NASA has determined that the Proposed Action is consistent with the Florida Coastal Management Plan and would not result in significant impacts on coastal uses and resources. As part of the CZMA determination process, NASA has provided this SEA to the FDEP and the Florida State Clearinghouse for review during the public review period.

3.4.2.5 Coastal Zone – Alternative 1

Impacts under Alternative 1 would be similar to those under the Proposed Action.

3.4.2.6 Coastal Zone – No Action Alternative

Under the No Action Alternative, there would be no new facilities or construction beyond what is currently authorized in the 2018 EA, or re-designation of land use or the Spaceport Growth Boundary. Therefore, there would be no impacts on the coastal zone.

3.5 Biological Resources

Biological resources include native vegetation, wildlife, and the habitats in which they occur. Protected species and invasive and non-native species also are considered in this section. Detailed descriptions of KSC biological resources and applicable regulations are available in Section 3.9.1 of the *KSC Center Master Plan PEIS* (NASA, 2016), Section 6 of the *KSC Vision Plan and Programmatic EA* (NASA, 2020a), and Sections 6 and 7 of *KSC-PLN-1911 Revision G*, *KSC ERD* (NASA, 2020b). The *Roberts Road SpaceX Operations Area Expansion Biological Assessment* provides the results of habitat and protected species surveys for the Proposed Action conducted in October 2021, and January and May 2022; this information is summarized below. The Project Footprint is the area that could physically be impacted due to construction and operation of the Proposed Action or Alternative 1.

The ROI for biological resources is KSC at-large. The areas considered for direct impacts are defined as follows: footprint of the Expansion Area North (100 acres); footprint of the Expansion Area South (115 acres); construction boundary along Saturn Causeway, within the LC-39A fence line, burn units 6.3, 6.2B, 6.2A, and 7.2A affected by the 1-mile operational smoke buffer; and the eastern shoreline of KSC for sea turtle lighting impacts only.

3.5.1 Affected Environment

3.5.1.1 Habitats and Vegetation

Changes to the ROI since the 2018 EA

Land coverages within the Project Footprint were assigned habitat classifications per the Florida Land Use, Cover and Forms Classification System (FLUCFCS) (Table 3-2 Land Cover/Land Use; Figure 3-1). Old citrus groves and Brazilian pepper were the dominant habitat types within the ROI for the 2018 EA, which is to the south of the Expansion Area (NASA, 2018a). By contrast, natural habitats comprise the majority of the Expansion Area alternatives (Table 3-2). As with the 2018 EA, the primary habitat within the burn units affected by the operational buffer is oak-palmetto scrub. Sea turtle beaches, which are over six miles away from the Project Footprint, are coastal strand habitat (NASA, 2020b). Although these areas would not be cleared, the Proposed Action may affect the burn regime and lighting environments of these habitats, respectively. Land uses along Saturn Causeway and at LC-39A were excluded as actions would occur in previously disturbed and maintained areas.

Table 5-4. Land Cover and Land Ose within Project Poolphilt.						
FLUCFCS Code	FLUCFCS Type*	Proposed Action (acres)	Alternative 1 ¹ (acres)			
224	Abandoned Tree Crops	-	-			
310	Herbaceous (Dry Prairie)	-	-			

Table 3-4. Land Cover and Land Use within Project Footprint.

FLUCFCS Code	FLUCFCS Type*	Proposed Action (acres)	Alternative 1 ¹ (acres)
320	Shrub and Brushland	21.4	6
420	Upland Hardwood Forests	-	-
425	Temperate Hardwood	-	-
434	Upland Mixed - Coniferous / Hardwood	11.5	-
437	Australian Pine	-	-
510	Streams and Waterways	1.4	-
530	Reservoirs	-	-
617	Mixed Wetland Hardwoods	57.1	68
618	Cabbage Palm Hammock	-	41
640	Vegetated Non-Forested Wetlands	-	-
641	Freshwater Marshes	3.1	-
646	Mixed Scrub-shrub Wetland	6.6	-
814	Roads and Highways	-	-

*Source: FDEP statewide land use cover dataset with adjustments based on field surveys Roberts Road Operations Area North ¹ Delineated wetland acreage is approximately 102 acres for Alternative 1





Source: FDEP statewide land use cover, field surveys

3.5.1.2 Wildlife and Protected Species

Changes to the ROI since the 2018 EA

The ROI for the 2018 EA primarily included degraded upland habitats and limited wetlands, but the natural habitats, including wetlands, within the current ROI are likely to support a greater diversity of fish, amphibians, reptiles, birds, and mammals, including multiple federally and state protected species (Table 3-3). The USFWS Information for Planning and Consultation tool (USFWS, 2023) and the Florida Natural Areas Inventory (Florida Natural Areas Inventory, 2023) were utilized to identify potential species. The KSC Environmental Baseline Document listing of special status species was narrowed based on the habitat types listed in Table 3-2, with updates to listing status based on the latest list of Endangered, Threatened, and Commercially Exploited Plants of Florida and lists of Florida's Endangered and Threatened Species (Floria Department of Agriculture and Consumer Services, 2023) (Florida Fish and Wildlife Commission, 2022).

Fish: The wetlands and waterways of the ROI for the Proposed Action provide habitat for some of the forty-one native and introduced fish species found on KSC (NASA, 2020b), but no federally protected or game fish species would be expected within the ROI.

Amphibians and Reptiles: Suitable habitat is present within the ROI for the Proposed Action for some of the seventy-four species of amphibians and reptiles that have been documented on KSC, including four federally listed species, one species listed due to similarity of appearance to a federally-listed species (American alligator, *Alligator mississippiensis*), and state listed gopher tortoise (*gopherus polyphemus*) (Table 3-3) (NASA, 2020b). During field reconnaissance for the Proposed Action, no federally listed reptile or amphibian species were observed in the ROI, but potential habitat for the threatened eastern indigo snake (*Drymarchon couperi*) (i.e., native uplands and hydric habitats) and state threatened Florida pine snake (*Pituophis melanoleucus mugitus*) (i.e., scrub and oak woodlands) was documented in the Project Footprint and operational buffer area (Table 3-3).

Limited suitable habitat for the state-listed gopher tortoise was observed within the Project Footprint, but potential habitat for the tortoise is present within areas affected by the operational smoke buffer (Table 3-3). Uplands within the proposed site boundary are poorly drained and have become overgrown. Previous studies at KSC have found local gopher tortoise populations densities to be similar in well drained and poorly drained soils (Breininger, Schmalzer, & Hinkle, 1994). Secondary marsh habitat used for feeding is also adjacent to the Project Footprint. No signs of gopher tortoise were observed during field surveys, but sea turtle nesting beaches for three federally listed species are along the eastern portion of KSC near LC-39A.

Birds: The ROI includes wetland and upland habitats that are suitable forage, roost, and nesting areas for some of the 318 migratory and year-round resident bird species documented on KSC (NASA, 2020b), including multiple state and federally listed species (Table 3-3). The expanded SpaceX Roberts Road Operations Area is located within the Core Foraging Area of a wood stork (*Mycteria americana*) colony, but no Suitable Foraging Habitat for the federally threatened wood stork was present. Within the Project Footprint, there is also potential wetland habitat for the federally listed eastern black rail (*Laterallus jamaicensis*) and multiple state-listed bird species; however, there is no habitat for shorebirds such as the federally-listed piping plover (*Charadrius melodus*), red knot (*Calidris canutus*), and roseate

tern (*Sterna dougallii dougalli*). The Project Footprint has low potential for habitat for the bald eagle (*Haliaeetus leucocephalus*), but there is a bald eagle nest within the Operational Buffer.

Three types of habitat have been defined to categorize the importance and roles of different landscapes for maintaining populations of the federally threatened Florida scrub-jay (FSJ) (Aphelocoma coerulescens). Core FSJ areas are described as primary habitat (oak scrub on well drained soils) and adjacent secondary habitat (large oak scrub ridges on poorly drained soils) that provide for large, contiguous clusters of territories. Support areas are smaller clusters of primary and secondary habitats outside of important fire management units. These may enhance population size and provide connectivity between population cores. Auxiliary habitats are mostly flatwoods with small scrub oak patches generally outside of fire management units. Auxiliary habitats are population sinks where mortality usually exceeds recruitment, but are considered to have the potential to become core or support habitats with sufficient management. FSJ habitat within and adjacent to the Proposed Action and operational buffer is shown in Figure 3-2. The Proposed Action encompasses 100 acres of auxiliary habitat. Alternative 1 contains 33.6 acres of auxiliary and 6.6 acres of support habitat. The burn units affected by the operational buffer for the Proposed Action contain 426.9 acres of FSJ core, 828.3 acres of support, and 1,993.6 acres of auxiliary habitat. The burn units affected by Alternative 1 contain 725.5 acres of FSJ core, 619.2 acres of support, and 1,506.3 acres of auxiliary habitat. There is no suitable habitat for FSJ within the construction boundary along Saturn Causeway or at LC-39A. No FSJs were observed during site visits.



Figure 3-2. Florida Scrub Jay Potential Territories and Bald Eagle Nests

Source: KSC Scrub Jay Potential Territories, MINWR 2021 Burn Units; Note: Operational buffer shown is for the Proposed Action

Mammals: Suitable habitat is present within the ROI for some of the twenty-nine species of mammals that have been documented on KSC (NASA, 2020b). The Project Footprint does not include habitat that would support any federally listed mammals; however, the tricolored bat (*Perimyotis subflavus*), a species

that has been proposed for federal listing as Endangered, may utilize live and recently dead hardwood and pine trees within the ROI.

Plants: No federally listed plants were identified within the ROI, but multiple state-listed plants have the potential to occur within the ROI based on habitat types.

	Status		Likelihood of Occurrence within ROI ¹		
Common Name (Scientific Name)	Federal	State	Footprint	1-mile Operational Buffer ²	Beach ³
Reptiles	1				
American Alligator (Alligator mississippiensis)	T(S/A)	-	Known to occur	Known to occur	None
Eastern Indigo Snake (Drymarchon corais couperi)	Т	FT	Medium	Medium	None
Florida Pine Snake (Pituophis melanoleucus mugitus)	-	ST	Medium	Medium	None
Gopher Tortoise (Gopherus polyphemus)	-	ST	Medium	Medium	None
Green Sea Turtle (Chelonia mydas)	E	FE	No habitat	No habitat	Known to Occur
Leatherback Sea Turtle (Dermocheyls coriacea)	E	FE	No habitat	No habitat	Known to Occur
Loggerhead Sea Turtle (Caretta caretta)	Т	FT	No habitat	No habitat	Known to Occur
Birds ⁴					
American Oystercatcher (Haematopus palliates)	-	ST	None	None	Low
Bald Eagle (Haliaeetus leucocephalus)	BGEPA	-	Low	Known to occur	Low
Black Skimmer (<i>Rynchops</i> niger)	-	ST	Low potential	Low potential	None
Eastern Black Rail (Laterallus jamaicensis jamaicensis)	т	FT	Medium	Medium	None
Florida Scrub-Jay (Aphelocoma coerulescens)	Т	FT	Low	Known to occur	None
Florida Sandhill Crane (Antigone canadensis pratensis)	-	ST	Low potential	Low potential	None

Table 3-5. Protected Wildlife Species with the Potential to Occur within the ROI

	Status		Likelihood of Occurrence within ROI ¹			
Common Name (Scientific Name)	Federal	State	Footprint	1-mile Operational Buffer ²	Beach ³	
Least Tern (<i>Sternula</i> antillarum)	-	ST	No habitat	No habitat	Low	
Little Blue Heron (<i>Egretta caerulea</i>)	-	ST	Medium	Medium	Low	
Piping Plover (Charadrius melodus)	Т	Т	No habitat	No habitat	Low	
Reddish Egret (Egretta rufescens)	-	ST	Low	Low	Low	
Red Knot (Calidris canutus)	т	FT	None	None	Low	
Roseate Tern (<i>Sterna dougallii dougallii</i>)	т	FT	None	None	Low	
Roseate Spoonbill (<i>Platalea</i> <i>ajaja</i>)	-	ST	Low	Low	None	
Southeastern American Kestrel (<i>Falco sparverius paulus</i>)	-	ST	Low	Medium	None	
Tricolored Heron (<i>Egretta tricolor</i>)	-	ST	Medium	Medium	None	
Wood Stork (Mycteria americana)	т	т	Medium	Medium	None	
Mammals						
Tricolored Bat (<i>Perimyotis</i> subflavus)	PE	-	Low	Low	None	
Southeastern Beach Mouse (Peromyscus polinotus niveiventris)	т	FT	None	None	Known to Occur	
West Indian Manatee (Trichechus manatus)	т	FT	None	None	None	
Plants						
Butterfly Orchid (Encyclia tampensis)	-	CE	Medium	Medium	N/A	
Celestial Lily (Nemastylis floridana)	-	E	Low	Low	N/A	
Chapman's Sedge (<i>Carex</i> chapmannii)	-	Т	Low	Low	N/A	
Cinnamon Fern (<i>Osmunda</i> cinnamonea)	-	CE	High	High	N/A	
Coontie (<i>Zamia</i> spp.)	-	CE	Medium	Medium	N/A	
	Stat	us	Likelihood o	of Occurrence wi	thin ROI ¹	
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Common Name (Scientific Name)	Federal	State	Footprint	1-mile Operational Buffer ²	Beach ³	
Cuplet Fern (<i>Dennstaedtia</i> <i>bipinnata</i>)	-	E	Low	Low	N/A	
Curtiss' Sandgrass (Calamovilfa curtissii)	-	Т	Low	Known to Occur	N/A	
Giant Orchid (Pteroglossaspis ecristata)	-	Т	Low	Low	N/A	
Green-fly Orchid (<i>Epidendrum</i> conopseum)	-	CE	Medium	Medium	N/A	
Hand Fern (Ophioglossum palmatum)	-	E	Medium	Medium	N/A	
Low Peperomia (<i>Peperomia</i> humilis)	-	E	Medium	Medium	N/A	
Many-Flowered Grass-Pink (Calopogon multiflorus)	-	т	Low	Low	N/A	
Nodding Club-Moss (Lycopodium cernuum)	-	CE	Medium	Medium	N/A	
Pine Pinweed (<i>Lechea divaricata</i>)	-	E	Low	Low	N/A	
Plume Polypody (<i>Polypodium plumula</i>)	-	E	Medium	Medium	N/A	
Royal Fern (<i>Osumnda regalis</i>)		CE	Medium	Medium	N/A	
Satin Leaf (Chrysophyllum oliviforme)		Т	Low	Low	N/A	
Saw Palmetto (Serenoa repens)	-	CE	Known to Occur	Known to Occur	N/A	
Widespread Polypody (Polypodium dispersum)	-	E	Medium	Medium	N/A	

Sources: Florida Natural Areas Inventory, Florida Fish and Wildlife Commission, KSC, USFWS

(BGEPA) Bald and Golden Eagle Protection Act; (CE) Commercially Exploited; (E) Endangered; (FE) Federally-designated Endangered; (FT) Federally-designated Threatened; (PE) Proposed Endangered; (T) Threatened; T(S/A) Threatened due to Similarity of Appearance.

¹No critical habitat is present within the ROI.

²The 1-mile operational buffer applies only to the Expansion Area.

³The beach ROI is included for potential lighting impacts only

⁴The majority of bird species at KSC are protected under the Migratory Bird Treaty Act.

Likelihood of occurrence:

None = No suitable habitat for the species present

Low = Some potentially suitable, low quality habitat present

Medium = Potentially suitable habitat present

High = Suitable habitat present

3.5.2 Environmental Consequences

Effects from the Proposed Action within the ROI were evaluated based upon: (1) an understanding of the methods and equipment to be used during construction and operations; (2) knowledge of the potential for such methods and equipment to disturb biological resources; and (3) awareness of the types of effects that have resulted from similar actions in the past. Pursuant to the Endangered Species Act, NASA has initiated formal Section 7 consultation with the USFWS to evaluate potential effects to federally listed species from the Proposed Action. Conservation measures and terms and conditions resulting from the consultation will be incorporated into the Final SEA, to be implemented as part of the Proposed Action.

3.5.2.1 Habitats and Vegetation – Proposed Action

With 100 percent build-out of the site, up to 31.8 acres of upland shrub and forest habitat, and up to 68.2 acres of wetland and waterway habitats would be lost and converted for purposes of development under the Proposed Action. As described in Section 3.8.2, this makes up approximately 0.06 percent of the total wetlands at KSC. Measures would be taken to minimize harm to adjacent wetlands, including adherence to permit conditions, and mitigation to compensate for wetland loss (see Section 3.8, Water Resources). Implementation of permit requirements and the sediment and erosion control plan would minimize the potential for adverse impacts to surrounding wetlands and aquatic habitats.

No federally listed plant species have been documented within the Project Footprint. While individual state-listed plants may be injured or killed by Proposed Action activities, the amount of potential habitat loss for these species would represent only a small portion of similar habitats nearby at KSC.

Due to the potential for invasive non-native species to negatively affect native vegetative communities, heavy equipment would be cleaned and determined to be weed-free before entering the construction site, and fill, landscaping, and erosion control materials must be certified weed-free. An invasive non-native plant management program would be implemented over the long-term, including the use of native plants in landscaping, and regular monitoring and control measures.

KSC, MINWR, and SpaceX would coordinate to ensure adequate prescribed burns in nearby firedependent habitats. The fire management units in proximity to the SpaceX Roberts Road campus are typically managed on a 4-5-year prescribed burn cycle. This coordination would prevent these areas from becoming overgrown and degraded. See Reductions in Prescribed Burning later in this section for discussion of prescribed burning impacts related to protected species' habitats.

Construction of the Proposed Action would have short-term, moderate, adverse, localized impacts on the relatively undisturbed approximate 100 acres of upland and wetland habitats to be developed under the Proposed Action. However, this area is small compared to the amount of suitable habitat available elsewhere on KSC and MINWR, and measures would be taken to control erosion and stormwater runoff, minimize invasive non-native species spread, ensure adequate prescribed burning in adjacent habitats, and mitigate for wetland impacts in accordance with permit requirements. Operation of the Proposed Action would have long-term, minor, indirect impacts on habitats and vegetation. Thus, the Proposed Action would not result in a significant impact on habitats or vegetation on KSC.

3.5.2.2 Habitats and Vegetation – Alternative 1

Construction of Alternative 1 would result in more impacts to aquatic habitat but fewer impacts to upland habitats compared to the Proposed Action. Alternative 1 is made up of approximately 13 acres of upland shrub and forest habitat and 102 acres of wetland and waterway habitats. As described in Section 3.8.2, this makes up approximately 0.10 percent of the total wetlands at KSC. Measures would be taken to minimize harm to adjacent wetlands, including adherence to permit conditions, and legally required mitigation to compensate for wetland loss (see Section 3.8, Water Resources). Implementation of permit requirements and the sediment and erosion control plan would minimize the potential for adverse impacts to surrounding wetlands and aquatic habitats. Impacts related to invasive non-native species and prescribed burns would be similar to those under the Proposed Action. Operation of Alternative 1 would result in similar impacts to the Proposed Action.

3.5.2.3 Habitats and Vegetation – No Action Alternative

SpaceX is currently coordinating with KSC and MINWR regarding a one-mile smoke buffer for the existing Roberts Road Operation Area. This coordination would continue under the No Action Alternative.

Under the No Action Alternative, there would be no new facilities or construction beyond what is currently authorized in the 2018 EA, or re-designation of land use or the Spaceport Growth Boundary. Therefore, there would be no impacts on habitats or vegetation.

3.5.2.4 Wildlife and Protected Species – Proposed Action

Impacts on wildlife from the Proposed Action may include direct physical impacts, disturbance due to noise and human presence, and habitat, degradation, fragmentation, and loss.

Construction and Daily Operations. The temporary disturbance and permanent alteration of habitat from land clearing and construction would impact the ability of affected wildlife to feed, breed, and shelter. While some displaced animals may establish new home ranges in other areas, some animals may encounter increases in competition and predation pressure. Habitat fragmentation and degradation may serve as barriers to animal movements and could result in long-term impacts on the health of certain populations if breeding and genetic diversity are affected. Additionally, any noise and human activity may elicit startle responses and cause animals to avoid the area around the Proposed Action. Noise levels would decrease once construction was completed, but there would be an increase in daily operational activities and traffic. Injury and mortality from collisions with vehicles and equipment would be reduced by measures such as wildlife watch signs, enforcement of speed limits, and instructions to contractors and personnel to avoid wildlife when possible.

The Proposed Action would result in the clearing of up to approximately 100 acres of auxiliary FSJ habitat. This type of habitat may also support the tricolored bat, which may utilize live and recently dead hardwood and pine trees within the ROI. Due to increased noise and human activity, most FSJ and tricolored bats would likely move to nearby habitat before clearing activities. Nevertheless, prior to clearing, surveys would be conducted of all suitable FSJ and tricolored bat habitat within the Project Footprint, and any nests or roosts encountered would be flagged. No clearing would be allowed within 300 feet until all birds/bats have fledged. As described in the *KSC FSJ Compensation Plan*, mitigation for direct impacts to scrub-jay habitat typically results in providing suitable habitat elsewhere (NASA, 2014).

Mitigation for auxiliary habitat impacts would occur at a 1:1 ratio for impacts adjacent to development. These mitigation activities would renovate or enhance existing FSJ habitat at KSC. The exact location of restoration activities would be determined by MINWR land managers and the NASA Environmental Management Branch. Potential indirect impacts to nearby FSJ habitat from reductions in prescribed burning are discussed later in this section, *Reductions in Prescribed Burning*. Additionally, the Proposed Action is outside of major scrub-jay population areas at KSC as described in the 2016 PEIS.

As the majority of the area impacted by construction is suitable habitat for the eastern indigo snake, up to approximately 100 acres of potential habitat would be cleared. Upland areas with the potential to support gopher tortoises and indigo snakes would be surveyed immediately prior to land clearing. If burrow impacts are unavoidable, surveys and relocations would be done in accordance with requirements in the latest *KNPR 8500.1, KSC Environmental Requirements*, and any indigo snakes would be allowed to vacate the burrow prior to collapsing it. Silt fencing around the site should reduce the potential for gopher tortoises and indigo snakes to enter the site. As a precaution, land clearing, construction, and maintenance personnel would be instructed to report any found burrows, and to halt activities if a gopher tortoise or indigo snake was encountered and allow the animal to leave the area before activities resumed. If a site requires burning of timber debris piles, the piles would be ignited from one side to allow indigo snakes and other wildlife in the pile to escape. The *Standard Protection Measures for the Eastern Indigo Snake* would be implemented, including notification of the USFWS, posters and pamphlets, and pre-clearing verbal education of SpaceX employees, the construction manager, and construction and maintenance personnel (USFWS, 2021a).

Construction in and near wetland and surface water habitats would affect the distribution of shelter, foraging, breeding, and nesting habitat for some species. In areas being filled, animals with limited mobility may be harmed during construction, while those that can leave the area may be subject to increased competition and predation. Indirect impacts associated with habitat fragmentation and changes in hydrology, water quality, and nutrient exchange may include limitations on animal movements and negative impacts on physiological functions (i.e., respiration) and genetic diversity and viability.

Due to increased noise and human activity, most animals would likely move into adjacent wetland habitats in advance of clearing and fill activities. However, to ensure that no nests of protected bird species would be affected, surveys would be conducted immediately prior to land clearing and any nests encountered would be flagged. Similarly, surveys for bald eagle, osprey, eastern black rail, wood stork, and other migratory bird nests and roosting areas would be conducted prior to clearing. If nests were identified, then land clearing activities near the nests would either be delayed until after fledging was completed and the birds had left the area, or NASA would coordinate with the USFWS regarding necessary mitigations or permits. Operations would observe the buffers identified in the *Habitat Management Guidelines for the Wood Stork in the Southeast Region* and *National Bald Eagle Management Guidelines*, as applicable (USFWS, 2007) (USFWS, 2010). During pre-clearing verbal education of SpaceX employees and contractors, SpaceX would communicate to personnel and contractors that feeding alligators is prohibited and disturbing nests is not authorized.

Impacts on wildlife from excess sedimentation and other runoff are not anticipated as SpaceX would implement erosion control and stormwater management measures in accordance with permit and KSC requirements (see Section 3.5, Water Resources). SpaceX personnel and contractors would comply with relevant hazardous material handling and management procedures, as well as spill prevention and

response procedures during construction and operational activities. Any accidental releases would be quickly controlled and cleaned up in accordance with federal, state, and NASA requirements, thus minimizing the potential for impacts on biological resources.

Reductions in Prescribed Burning: Multiple protected species are dependent on fire-maintained scrub habitat like that found within the ROI, including the FSJ, indigo snake, and gopher tortoise. The 1-mile operational buffer (smoke-restricted area) around the SpaceX Roberts Road Operations Area has the potential to restrict prescribed burning in burn units 6.2A, 6.2B, 6.3, and 7.2A, with resulting degradation of habitat and increased risk of catastrophic wildfires, both which would likely result in a decrease in FSJ demographic performance and usage of the area by tortoises and indigo snakes. Without prescribed fire at intervals that can maintain habitat in open medium (optimal habitat with oak height of 1.3-1.7 m), closed-medium (1.2 - 1.7 m) transitional stages, FSJ yearling production would either decrease or would not outpace breeding bird mortality, resulting in a decrease in average birds within family groups. See the *BO for KSC SpaceX Operation and Florida Power Light (FPL) Solar Facility* for additional detail on burning in FSJ and indigo snake habitat at KSC (USFWS, 2018).

To avoid degradation of these habitats, SpaceX, NASA, and MINWR would follow conservation measures similar to those described in the BO for KSC SpaceX Operation and FPL Solar Facility (USFWS, 2018) including maintenance of a 30.5 m (100 ft) wide buffer within the parcel on the north and west sides as a defensible fire space and continued coordination among KSC, MINWR, and the proponent to ensure adequate prescribed fire in burn units 6.2A, 6.2B, 6.3, and 7.2A at the time of year deemed appropriate by MINWR. Prescribed burning would be conducted with a sufficient frequency (4-5 year cycle) to maintain suitable habitat and in accordance with the Memorandum of Understanding between the 45th Space Wing, the United States Fish and Wildlife Service, and John F. Kennedy Space Center for Prescribed Burning on the Merritt Island National Wildlife Refuge, John F. Kennedy Space Center, and Cape Canaveral Air Force Station, Florida, hereafter referred to as the Prescribed Burning MOU (45 SW, USFWS, and KSC, 2019). If MINWR is not able to meet the intent of the Prescribed Burning MOU for this area (6.2A, 6.2B, 6.3, and 7.2A) due to operational buffer restrictions, solely imposed by SpaceX operations at their Roberts Road campus, that limit burning, then SpaceX would work with KSC and MINWR to support a separate burn, and if not possible, work with KSC and MIWNR to provide mitigation agreed upon by all parties. All requirements resulting from the current Section 7 consultation with the USFWS will be implemented; once completed, consultation requirements will be integrated into the Final SEA. To preclude flight hardware processing impacts to prescribed burn operations, SpaceX would design appropriate HVAC systems into their facilities to protect personnel and hardware against the possibility of smoke intrusion associated with prescribed burn operations.

Bird Collisions: As discussed in the 2018 EA, birds are susceptible to striking buildings, towers, and wires, resulting in entrapment, exhaustion, injury, or death (NASA, 2018a). The majority of species in the vicinity of the Proposed Action are not listed as threatened or endangered but are protected under the Migratory Bird Treaty Act. Because KSC is located along the Atlantic Flyway migration route, bird strike potential is reasonably high during the fall and spring. These birds may be attracted to or disoriented by warning lighting systems and window reflections. Strike risk increases with tall structures, particularly those that use steady burning lights, are in areas with frequent inclement weather patterns (i.e., storms, fog), have guy wire supports, and are in areas with a higher density of migrating birds. As proposed facilities may be up to 400 feet tall, measures to reduce bird collisions will be addressed in the final design; the Proposed

Action will comply with FAA obstruction and marking guidelines and will employ USFWS best practices for reducing bird collisions with buildings and towers, as applicable [(USFWS, 2021b) and (USFWS, 2021c)].

Night Lighting: Lighting at night can disorient animals, interrupt nesting and foraging activities and potentially result in collisions. Sky glow from nighttime lighting at the Proposed Action site could cause nesting and hatchling sea turtles to crawl in the wrong direction, leaving them vulnerable to exhaustion, dehydration, and predation. To minimize lighting impacts, a lighting management plan would be prepared in accordance with the KSC exterior lighting requirements in the latest *KNPR 8500.1, KSC Environmental Requirements*, in the *BO for KSC Master Plan Operations* (USFWS, 2017), and the KSC Lighting Operations Plan (KSC-PLN-1210, Rev A). Facilities would also be designed to operate long-wavelength light fixtures, as outlined in the KSC exterior lighting requirements.

Summary of Impacts on Wildlife from the Proposed Action: Overall, the Project Footprint is small compared to the amount of suitable wildlife habitat available elsewhere on KSC. Accordingly, construction of the Proposed Action would result in short-term, moderate, adverse, localized impacts to wildlife. Measures would be taken to control erosion and stormwater runoff, minimize invasive non-native species spread, minimize impacts from tall structures and nighttime lighting, and ensure adequate prescribed burning in adjacent habitats. Thus, operation of the Proposed Action would cause long-term, minimal to moderate, adverse impacts to some wildlife but would not result in significant impacts on wildlife at KSC. NASA has determined that the Proposed Action may affect and is likely to adversely affect the federally protected FSJ. NASA has determined the Proposed Action may affect but is not likely to adversely affect the eastern indigo snake, wood stork, eastern black rail, and sea turtles. NASA determined there would be no effect on the red knot, piping plover, roseate tern, manatee, or southeastern beach mouse. The Final SEA will include the USFWS prepared BO, which addresses effects on endangered and threatened species due to the Proposed Action. USFWS prescribed reasonable and prudent measures/terms and conditions set forth in the Incidental Take Statement section of the BO will be implemented as part of SpaceX's site development plan.

3.5.2.5 Wildlife and Protected Species – Alternative 1

Impacts on wildlife and protected species from Alternative 1 would be similar to those under the Proposed Action. Up to 102 acres of wetland and waterway habitat would be impacted for the Alternative 1 site. As discussed for the Proposed Action, operational and construction procedures would be implemented to avoid or reduce impacts to wildlife and protected species.

The operational buffer for Alternative 1 would include burn units 6.2A, 6.2B, 6.3 7.2A, and 8.3. The Alternative 1 site would impact 33.6 acres of auxiliary FSJ habitat and 6.6 acres of support habitat. As with the Proposed Action, these impacts would be mitigated at the ratios described in the KSC Florida Scrub Jay Compensation Plan, discussed in detail in Section 4.1.

3.5.2.6 Wildlife and Protected Species – No Action Alternative

Under the No Action Alternative, there would be no new facilities or construction beyond what is currently authorized in the 2018 EA, or re-designation of land use or the Spaceport Growth Boundary. Therefore, there would be no impacts on wildlife and their habitats.

3.6 Cultural Resources

Cultural resources and historic properties are components of the human environment considered under NEPA and the National Historic Preservation Act (NHPA) of 1966. Cultural resources may include locations or landscapes, traditional use sites, or physical remnants associated with past and/or present human activity. Further, physical remnants of cultural resources are usually referred to as historic properties. The NHPA defines historic properties as, "any prehistoric or historic district, site, building, structure, or object included on, or eligible for inclusion on, the National Register, including artifacts, records, and material remains relating to the district, site, building, structure, or object." NASA complies with the implementing regulations to Section 106 of the NHPA, 36 C.F.R. Part 800 (Protection of Historic Properties), as well as KSC Cooperative Agreement 4185 (Programmatic Agreement for Management of Historic Properties at KSC) in order to take into account the effects of their undertakings on historic properties and affords the Advisory Council on Historic Preservation, State Historic Preservation Officer, and affected tribes a reasonable opportunity to comment. NASA must also comply with a number of other federal statutes and regulations, such as the Native American Graves and Repatriation Act and the Archaeological Resources Protection Act, to consider impacts to cultural resources and historic properties. KSC developed an Integrated Cultural Resource Management Plan (ICRMP) (NASA, 2018c) reflecting NASA's commitment to the protection of its significant cultural resources and compliance with these various statutes and regulations. The regulatory framework governing preservation and documentation of cultural resources on KSC can be found in the ICRMP and the 2016 PEIS. Compliance with Section 106 of the NHPA satisfies these requirements. The ROI is the Area of Potential Effects (APE), discussed below.

3.6.1 Affected Environment

For the Expansion Area, an APE was established to identify and evaluate potential effects to historic properties. The APE was defined to consider effects to both archaeological and architectural resources. The APE for archaeology included the construction footprints of the Expansion Area; it is limited to the land area that would physically be disturbed by the project. The APE for architecture included the footprints of the Expansion Area, plus a one mile viewshed to account for the potential height of new structures at Roberts Road.

Within the Expansion area APE, a Phase I cultural resources assessment survey (CRAS) was conducted in August 2022 by SEARCH, Inc. to identify historic properties listed or eligible for listing in the National Register of Historic Places (NRHP) that may be affected by the proposed project. No previously documented archaeological resources exist within the archaeological APE and an archaeological survey did not identify new sites. Additionally, an adjacent area within the FPL lease boundary along Roberts Road was evaluated in support of *Draft Environmental Assessment for the Construction of Solar Photovoltaic Facilities at the John F. Kennedy Space Center, Kennedy Space Center, Florida* (NASA, 2018b), and was determined unlikely to have archaeological sites.

Five resources were identified in the architectural APE. Three previously recorded historic properties include the NRHP-eligible Solid Rocket Booster Assembly and Refurbishment Facility Manufacturing Building #L6-0247 (8BR1998), the NASA Railroad at KSC (8BR2931), and the NASA KSC Railroad System Historic District (8BR2932). Two new resources were recorded - the Roberts Road Footbridge (8BR4443) and a KSC Communications Tower (8BR4444). The Roberts Road Footbridge is a concrete and limestone

footbridge spanning a ditch to connect a former orange grove and home site north of the road. The KSC Communications Tower is a steel structural tower for communications and weather equipment; see Table 3-4 Resources. 8BR04443 and 8BR04444 are ineligible for listing in the NRHP and NASA determined that the proposed project would not adversely affect historic properties. Concurrence from the Florida State Historic Preservation Office regarding these determinations for historic resources around the Expansion Area was received on November 3, 2022. See Appendix A.

The Saturn Causeway widening and duct bank construction for utility upgrades will involve ground disturbing activities that improve upon existing infrastructure and take place in previously established roadway and utility corridors. Multiple archaeological surveys have been undertaken within and adjacent to the project area with no discovery of archaeological resources. The majority of Saturn Causeway underwent reconnaissance survey in 1974; no resources were identified. In the 1990s, KSC completed additional systematic studies included background research, reconnaissance surveys, and subsurface surveys to establish zones of archaeological probability and identify archaeological sites. A 1990 survey entitled Archaeological Survey to Establish Zones of Archaeological Potential (ZAPs) in the VAB and Industrial Areas of the Kennedy Space Center noted heavy development and modern alteration along the majority of Saturn Causeway and concluded that there was no archaeological potential due to the degree of land modification completed to build the VAB, crawlerway and turning basin. Further a 1991 survey entitled Archaeological Survey to Establish Zones of Archaeological Potential (ZAPs) in the Launch Complex Area (Option 1) noted that the coastal strand had been impacted by prior residential development and demolition as well as the construction of NASA launch facilities. Subsurface survey was conducted at the northeastern edge of Launch Complex 39A (adjacent to, but not within the project area) to relocate a previously recorded archaeological site and noted that the site had been completely destroyed due to land alterations. A 2009 survey entitled Historic Context and Historic Period Archaeological Site Location Predictive Model for the John F. Kennedy Space Center Volusia and Brevard Counties, Florida identified the potential for historic period sites through archival research. That study only identified the potential for one historic archaeological site in the vicinity of the C5 substation. A 2023 archaeological survey entitled Cultural Resource Assessment Survey Saturn Substation and Distribution Project in Brevard County, Florida examined this area through subsurface testing with negative findings.

Resource Identification Number	Name	NRHP Status
8BR91998	Solid Rocket Booster Assembly and Refurbishment Facility Manufacturing Building #L6-0247	Eligible
8BR2931	Nasa Railroad at KSC	Eligible and contributing to the NASA KSC Railroad System Historic District
8BR2932	NASA KSC Railroad System Historic District	Eligible
8BR04443	Roberts Road Footbridge	Ineligible
8BR04444	KSC Communications Tower	Ineligible

Table 3-6. Resources within Roberts Road Expansion APE

3.6.2 Environmental Consequences

3.6.2.1 Proposed Action

The Proposed Action would not impact any cultural resource or alter the character defining features of historic properties. Facilities constructed under the Proposed Action would be consistent with the visual landscape of KSC. Accordingly, there would not be an impact to the historic setting or viewshed of the Solid Rocket Booster Assembly and Refurbishment Facility Manufacturing Building #L6-0247, NASA Railroad at KSC, or the NASA KSC Railroad System Historic District. Due to previous archaeological surveys, no known archaeological sites would be affected and the presence of unknown archaeological sites would be affected and the presence of unknown archaeological sites would be highly unlikely due to previous land altering activities noted in the various surveys. If any inadvertent discovery of archaeological materials were to occur during project construction, KSC would follow protocols outlined in the ICRMP and Programmatic Agreement for Management of Historic Properties at KSC and consult further with the Florida State Historic Preservation Office. Therefore, the Proposed Action would not result in a significant impact on cultural resources.

3.6.2.2 Alternative 1

Alternative 1 would likely result in impacts to cultural resources similar to those under the Proposed Action. If Alternative 1 were to move forward, a Cultural Resource Assessment Survey would be conducted and NASA would consult with the Florida State Historic Preservation Office prior to construction. Any impacts to historic properties, if present, would undergo appropriate consideration per the Programmatic Agreement for Management of Historic Properties at KSC and 36 C.F.R. Part 800.

3.6.2.3 No Action Alternative

Under the No Action Alternative, there would be no new facilities or construction beyond what is currently authorized in the 2018 EA, or re-designation of land use or the Spaceport Growth Boundary. Therefore, there would be no impact on cultural resources.

3.7 Air Quality

Air quality is the measure of the condition of the air expressed in terms of ambient pollutant concentrations and their temporal and spatial distribution. Air quality regulations in the United States are based on concerns that high concentrations of air pollutants can harm human health, especially for children, the elderly, and people with compromised health conditions; as well as adversely affect public welfare by damage to crops, vegetation, buildings, and other property. A detailed discussion of the regulatory framework is included in Section 3.6.1 of the 2016 PEIS. The ROI for air quality is Brevard County.

3.7.1 Affected Environment

Changes to the Region of Influence (ROI) since the 2018 EA

There are no significant changes to the ROI since the 2018 EA. Brevard County continues to be classified as an attainment area for all criteria pollutants (USEPA, 2022a), and accordingly does not require a General

Conformity Determination. KSC operates under a Title V Air Operation Permit for air quality, as described in the 2016 PEIS.

3.7.2 Environmental Consequences

3.7.2.1 Proposed Action

Construction of the Proposed Action would result in the emission of criteria pollutants similar to those discussed in the 2018 EA and the 2016 PEIS. The 2016 PEIS evaluated annual emissions of a large construction project up to 1 million gross square feet per year and determined they would be below the National Ambient Air Quality Standards (NAAQS) *de minimis* threshold, resulting in a less than significant effect. The Proposed Action would be constructed over multiple years and would not exceed 1 million gross square feet of construction in a single year. Emissions from construction would be temporary in nature and would be mitigated through the use of best management practices (BMPs).

The Federal Highway Administration considers projects to have a low potential for effect for mobile source air toxics when design year traffic is below 140,000 - 150,000 vehicles per day (Federal Highway Administration, 2016). Described in detail in Section 3.10.2, the traffic from the Proposed Action would be substantially lower than these volumes. Accordingly, emissions from vehicular traffic would have low potential effects from mobile source air toxics.

Operation of the Proposed Action is not anticipated to result in emissions that would prevent the state of Florida from complying with NAAQS or other requirements under the Clean Air Act. Emissions from operations such as manufacturing, payload processing, and other industrial processes would be dependent on final site layout and processes implemented at the Expansion Area. SpaceX would acquire a Title V or other applicable permit prior to operation if there was a threshold exceedance for major sources or hazardous air pollutants. SpaceX would implement BMPs and other measures to reduce emissions.

Construction of the Proposed Action would result in short-term, minor, direct, localized impacts to air quality. The operation of the Proposed Action would result in long term, direct, minor impacts on air quality. Adhering to all requirements of local, state, and federal permits would result in impacts less than significant. SpaceX would continue to work at identifying and implementing measures to reduce operations emissions.

3.7.2.2 Alternative 1

Short- and long-term impacts to air quality from Alternative 1 would be similar to those under the Proposed Action.

3.7.2.3 No Action Alternative

Under the No Action Alternative, there would be no new facilities or construction beyond what is currently authorized in the 2018 EA, or re-designation of land use or the Spaceport Growth Boundary. Therefore, there would be no project-related impacts to air quality.

3.8 Climate

Climate change is a global phenomenon that can have local impacts, including warming temperatures and sea level rise. A detailed discussion of the regulatory framework for climate is included in Section 3.7.1 of the 2016 PEIS. The ROI for climate is the east-central Florida region.

3.8.1 Affected Environment

Changes to the Region of Influence (ROI) since the 2018 EA

There are no significant changes to the ROI since the 2018 EA. CEQ guidance on greenhouse gas (GHG) emissions and climate change has been updated since the completion of the 2018 EA. The 2016 final guidance was withdrawn in 2017 and replaced with 2019 draft guidance. The 2019 draft guidance was rescinded in 2021, which reinstated the 2016 guidance and is being analyzed for revision and update. The 2016 guidance did not establish significance thresholds for GHG emissions. In 2023 CEQ issued interim guidance building upon the 2016 final guidance.

3.8.2 Environmental Consequences

3.8.2.1 Proposed Action

GHG emissions would be similar to those evaluated in the 2018 EA. The Expansion Area is larger than the existing SpaceX Roberts Road Operations Area, and as such is expected to have higher amounts of GHG emissions resulting from construction. However, these GHG emissions would be short term and subside when construction was completed. Operation of the site is not anticipated to create a substantial amount of GHG emissions for the long term, as KSC transitions to non-fossil fuel power sources such as the FPL solar field adjacent to the site. Therefore, the Proposed Action would result in long-term, direct, minor impacts to climate.

3.8.2.2 Alternative 1

Short- and long-term GHG emissions from Alternative 1 would be similar to those under the Proposed Action.

3.8.2.3 No Action Alternative

Under the No Action Alternative, there would be no new facilities or construction beyond what is currently authorized in the 2018 EA, or re-designation of land use or the Spaceport Growth Boundary. Therefore, there would be no project-related impacts to climate.

3.9 Water Resources

Chapter 3.4 of the *2016 Master Plan Programmatic EIS* (NASA, 2016) and Section IV of the ERD (NASA, 2020b) describe in detail the water resources (water quality, regulations, permitting, etc.) within KSC. The ROI for this resource area is KSC, in particular, the sub-area of KSC consisting of the Expansion Area and corresponding watershed. The ROI for water resources is KSC-at large.

3.9.1 Affected Environment

3.9.1.1 Surface Waters

Changes to the ROI since the 2018 EA

The receiving body of water in the watershed (the Indian River Lagoon) is unchanged from the 2018 EA as are the listed 303(d) impairments and established total maximum daily loads (USEPA, 2022c).

Historic citrus agriculture in the SpaceX Roberts Road Operations Area required extensive ditching to drain the land to make it suitable for production; however, areas of freshwater wetlands remain within the ROI (Figure 3-3). These include scrub-shrub and emergent freshwater wetlands. No ditching related to citrus agriculture is present within the Project Footprint. Wetland field delineations were completed for the Proposed Action and overlaid with delineations completed as part of the FPL solar farm, as shown in Figure 3-3. A desktop delineation was completed for Alternative 1 using LiDAR and soil data to estimate wetland boundaries. There are no wetlands or streams present within the construction boundary for Saturn Causeway widening.



Figure 3-3. Water Resources at the SpaceX Roberts Road Operation Area

Source: Field surveys, FDEP ERP 377877, desktop delineation

3.9.1.2 Floodplains

Changes to the ROI since the 2018 EA

The majority of KSC lies within the 100-year floodplain. The 100-year and 500-year floodplains are present in the ROI. As depicted on Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map

12009C0240H and 12009C0245H (FEMA, 2022), the Project Footprint is within Zone AE (1% annual chance flood), Zone X (0.2% annual chance flood hazard [e.g., the 500-year floodplain] or areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile) and areas of no flood hazard. There are no regulatory floodways within the Project Footprint. These flood hazard areas are depicted on Figure 3-4 and Figure 3-5.

Figure 3-4. FEMA Flood Hazard Areas at the SpaceX Roberts Road Operations Area



Source: FEMA National Flood Hazard Layer



Figure 3-5. FEMA Flood Hazard Areas at Saturn Causeway/LC-39A

Source: FEMA National Flood Hazard Layer

3.9.1.3 Groundwater

Changes to the ROI since the 2018 EA

There are no changes to the ROI since the 2018 EA. Only the surficial aquifer at KSC has the potential to be affected by the Proposed Action. The Proposed Action is located within the West Plain, Dune-Swale, and Marsh surficial aquifer subsystems at KSC (NASA, 2020b).

3.9.2 Environmental Consequences

Determination of water resource impacts is based on an analysis of the potential for activities to affect surface water or groundwater quality and the Proposed Action's compliance with applicable laws and regulations. Activity-related introduction of contaminants into surface water or groundwater resources, and physical alterations or disturbances of overland surface water flows and groundwater recharge are considered in this analysis.

When land is developed, the hydrology, or the natural cycle of water, can be altered. Replacement of vegetation with an impervious surface eliminates potential for infiltration and speeds up delivery of the water to nearby drainage areas. Impacts on hydrology result from land-clearing activities, disruption of the soil profile, loss of vegetation, introduction of pollutants, new impervious surfaces, and an increased rate or volume of runoff after major storm events.

Environmental impacts to surface and ground water may be avoided, or mitigated to a level below what constitutes a significant impact, during the building design and construction phases of a proposed action.

Implementation of erosion control measures, stormwater management plans, flood control infrastructure, preservation of pervious surfaces, proper landscape design, and appropriate structural engineering designs may all be incorporated to avoid significant adverse effects to ground and surface water resources.

3.9.2.1 Surface Waters – Proposed Action

For the Proposed Action, up to approximately 66.8 acres of wetlands and 1.4 acres of surface waters would be disturbed. Replacement of pre-development (natural) pervious surfaces with impervious surfaces, such as concrete, eliminates any potential for stormwater infiltration and can result in alteration of drainage patterns and increased nutrient loading to adjacent surface waters. Effects on wetlands, such as filling, would require a CWA section 404 permit and/or an Environmental Resource Permit from the St. Johns River Water Management District (SJRWMD). Prior to proceeding with the Proposed Action, SpaceX would consult with the FDEP and SJRWMD and acquire and adhere to all permits and mitigation requirements. A discussion of SpaceX's planned approach for mitigation is included in Section 4.2.

Effects of wetland fill include increased sedimentation to area surface waters, wetland fragmentation, loss of groundwater recharge area, flooding, and alteration of local drainage patterns. Conversion of vegetation type alters wetland functions and values including hydrology and wildlife use. Typically, clearing forested wetlands alters the hydrology and results in an increase in the availability of water or "wetter" wetlands. Herbaceous wetland plants colonizing the converted wetland typically have less evapotranspiration rates compared to wetland trees. This may result in an upland shift of wetland hydrology (Sun, et al., 2001). Vehicles used during the initial clearing, compact the soil and create ruts or churned areas, which can lower soil water-holding capacity and drainage. Minimization measures would be determined during final design.

Construction of the Proposed Action would require a Florida National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharge from Large and Small Construction Activities. Permit requirements include the preparation and implementation of a site-specific Stormwater Pollution Prevention Plan (SWPPP) to manage stormwater discharges and control erosion during and after construction until the area is stabilized. An ERP Stormwater Management Permit would also be required from SJRWMD. SpaceX would conduct regular compliance inspections of the SWPPP and specify BMPs that would minimize impacts to water quality. BMPs would be project specific but may include the use of silt fences, covering soil stockpiles, using secondary containment for hazardous materials, and revegetating the site in a timely manner.

Because a SWPPP and BMPs would be employed during construction of the facilities associated with the Proposed Action, significant impacts to surface waters due to runoff and/or inadvertent discharge would not be expected from construction activities. The Indian River Lagoon is an impaired water source pursuant to the Clean Water Act (CWA) Section 303(d). The Proposed Action is subject to nutrient loading requirements as described in the 2021 North Indian River Lagoon Basin Management Action Plan (FDEP, 2021). Under the plan, KSC received a nutrient reduction allocation of 12,153 pounds per year of total nitrogen and 1,775 pounds per year of total phosphorus. The Proposed Action would meet the nitrogen and phosphorus loading requirements identified through the use of BMPs and other stormwater treatment methods. Accordingly, potential impacts to the Indian River Lagoon would be reduced. There are no other Section 303(d) impaired water sources in the vicinity of the Proposed Action.

If necessary, SpaceX would obtain a multi-sector general permit from FDEP to manage stormwater discharge during site operation. SpaceX would comply with permit conditions and implement BMPs, reducing the potential for surface water impacts due to site operations.

Up to approximately 68.2 acres of freshwater wetlands would potentially be filled. These represent 0.06 percent of the total wetlands and 0.27 percent of the freshwater wetlands, respectively, at KSC. Compensatory mitigation would be required as part of the permitting process. Mitigation is the restoration, creation, or enhancement of wetlands to make up for permitted wetlands losses in another location. SpaceX is proposing to utilize available mitigation credits and/or permittee-responsible mitigation. The permittee-responsible mitigation would be an FDEP and/or SJRWMD approved mitigation plan using in- or out- of- basin mitigation to offset impacts. The mitigation plan would be developed in coordination with the FDEP and/or SJRWMD and subject to their ultimate approval prior to any issuance of a permit and subsequent impacts to wetlands. Prior to construction, SpaceX would require approval from the FDEP and/or SJRWMD to utilize out-of-basin mitigation. Measures would be taken to minimize harm to surrounding, non-filled wetlands, including implementing BMPs and adherence to permit conditions. Accordingly, there would be adverse, direct, short-term, localized impacts to wetlands due to construction. Operation of the Proposed Action would result in indirect, long-term, minor impacts to surface waters through the implementation of BMPs and adherence to permit conditions. However, through the replacement of lost wetland functions through the permitting and mitigation process and the implementation of BMPs there would be no significant impacts.

3.9.2.2 Surface Waters – Alternative 1

Alternative 1 would result in filling up to 102 acres of surface waters for the expansion of the SpaceX Roberts Road Operations Area. These represent 0.10 percent of the total wetlands and 0.40 percent of the freshwater wetlands, respectively, at KSC. As with the Proposed Action, SpaceX would utilize a combination of available wetland credits and permittee-responsible mitigation. Alternative 1 would obtain all necessary permits and utilize SWPPS and BMPs to avoid and minimize potential impacts to surface waters.

3.9.2.3 Surface Waters – No Action Alternative

Under the No Action Alternative, there would be no new facilities or construction beyond what is currently authorized in the 2018 EA, or re-designation of land use or the Spaceport Growth Boundary. Accordingly, there would be no change in impervious surfaces or surface waters.

3.9.2.4 Floodplains – Proposed Action

The Proposed Action would develop areas within the 100 and 500-year floodplains at KSC. Development in a floodplain can obstruct or divert floodwater to other areas, alter flood dynamics, flood adjacent areas, and increase flood duration. Final site selection and design would be done to minimize development within the floodplain as feasible, and final impacts may be reduced.

Measures to minimize floodplain impacts include siting facilities to minimize development within the floodplain, creating compensatory storage (excavating material within or adjacent to the same floodplain to be used as fill), or designing the facilities and related infrastructure to allow for dispersal of floodwaters. Any facilities constructed in the floodplain would be elevated or otherwise floodproofed per NASA

floodplain construction requirements. Significant impacts from development within the floodplain would not be expected because there are very few upstream/upland facilities. The Proposed Action would have short-term, moderate, localized impacts to floodplains and no significant, long-term, major, adverse impacts to floodplains. There would be no floodplain or flooding impacts to off NASA areas.

NASA would ensure that the actions comply with EO 11988, Floodplain Management, to the maximum extent possible. Because the Proposed Action would involve construction in the floodplain that would have to be allowed by NASA, this SEA serves as NASA's means for facilitating public review as required by EO 11990, Protection of Wetlands, and EO 11988.

3.9.2.5 Floodplains – Alternative 1

Impacts to floodplains from Alternative 1 would be similar to the Proposed Action. Alternative 1 contains a higher acreage of 100-year floodplain than the Proposed Action, but a smaller acreage of 500-year floodplain.

3.9.2.6 Floodplains – No Action Alternative

Under the No Action Alternative, there would be no new facilities or construction beyond what is currently authorized in the 2018 EA, or re-designation of land use or the Spaceport Growth Boundary. Therefore, there would no additional impact on floodplains on KSC.

3.9.2.7 Groundwater – Proposed Action

Due to the high-water table, groundwater (surficial aquifer) may be encountered during construction activities. Some dewatering of groundwater may be required; however, the amount of short-term dewatering would not be expected to have an effect on groundwater levels, and groundwater levels would return to normal upon completion of construction. The SWPPP developed for the NPDES permit would put in place BMPs to address and prevent spills that could potentially enter the surficial aquifer. Thus, there would be short-term, minor, localized impacts to groundwater and no significant impacts. Due to the depths to the other aquifers and the confining layers in-between there would be no effects to other, deeper, aquifers.

3.9.2.8 Groundwater – Alternative 1

Alternative 1 would result in impacts to groundwater similar to those under the Proposed Action.

3.9.2.9 Groundwater – No Action Alternative

Under the No Action Alternative, there would be no new facilities or construction beyond what is currently authorized in the 2018 EA, or re-designation of land use or the Spaceport Growth Boundary. Therefore, there would be no impacts causing groundwater degradation.

3.10 Geology and Soils

Section 3.3.1 of the 2016 PEIS and Section 4 of the ERD provide a detailed discussion of the geological history of KSC and overall soil and land types found there. The ROI for the Proposed Action includes the

areas where ground disturbance may occur due to the SpaceX Roberts Road Operations Area Expansion or Alternative 1. Soils along Saturn Causeway and at LC-39A were excluded as those actions would occur in previously disturbed areas.

3.10.1 Affected Environment

Changes to the ROI since the 2018 EA

Soil and geological resources remain largely the same at KSC since the 2018 EA. Soils within the ROI and identified by the National Resources Conservation Service Soil Survey are made up of thirteen soil types. Table 3-5 summarizes the type of soils found within the study area. The soils vary between poorly and very poorly drained. There are no unique geological features of exceptional interest or mineral resources within the Project Footprint.

Soil	Acres in Study Area	Percent of Study Area
Basinger sand, depressional	8.5	3.9%
Bradenton fine sand, limestone substratum	114.5	52.9%
Chobee mucky loam fine sand, depressional	6.9	3.2%
Copeland-Bradenton-Wabasso complex,	75.2	34.7%
limestone substratum		
Immokalee sand, 0 to 2 percent slopes	6.8	3.1%
Myakka sand, 0 to 2 percent slopes	1.5	0.7%
Wabasso sand, 0 to 2 percent slopes	3.0	1.4%

Table 3-7. Soil Types in Project Study Area

3.10.2 Environmental Consequences

3.10.2.1 Proposed Action

Land clearing and site preparation would cause disturbance to upper layers of soils, but these soil types are common throughout KSC. Overall, there would be short-term, direct, minor, adverse, localized impacts to geology and soils. Therefore, there would be no significant impact on geology or soils.

3.10.2.2 Alternative 1

Alterative 1 would result in impacts to geology and soils similar to those under the Proposed Action.

3.10.2.3 No Action Alternative

Under the No Action Alternative, there would be no new facilities or construction beyond what is currently authorized in the 2018 EA, or re-designation of land use or the Spaceport Growth Boundary. Therefore, there would be no impact on geology or soils.

3.11 Transportation

Chapter 3.12 of the 2016 Master Plan Programmatic EIS (NASA, 2016) describes in detail the transportation network present at KSC, including rail, public transportation, and waterways. The ROI for

this document includes the roadways near the existing SpaceX Roberts Road Operations Area, the road network at KSC, and the roadways that provide access to KSC. This section addresses existing regional transportation involving the roadway network, average daily traffic and KSC transportation systems involving the roadway network and traffic. Traffic is commonly measured through average daily traffic and design capacity. The ROI for transportation is KSC at-large.

Intersection capacity and traffic operations are evaluated by their LOS, which is a rating system that uses a letter grade from A (free-flowing traffic) to F (stop and go). LOS is determined by the overall delay a driver may experience at an intersection during peak hour traffic. Intersections are considered failing at a LOS F.

3.11.1 Affected Environment

Changes to the ROI since the 2018 EA

Transportation conditions at KSC remain largely unchanged from the description included in 2018 EA. The current KSC road network consists of 564 miles of roads, including 184 miles of paved roads, 380 miles of unpaved roads, and numerous trails and access roads. All paved roads on KSC conform to the American Association of State Highway and Transportation specification H20-S16, which establishes a load bearing capacity of 20 tons for a tractor truck and a gross single axle weight of 16 tons (NASA, 2020b). While the NASA Parkway is the primary entrance and exit for cargo, tourists, and personnel to KSC, access to KSC can also be made via State Road (SR) 3 (N Courtenay Parkway) from the south (via Gate 2). KSC is also accessible to the north by way of the A. Max Brewer Parkway (Gate 4). Both N Courtenay Parkway and the A. Max Brewer Parkway provide access to the MINWR. All roads to KSC have controlled access points. While public access to KSC is directed to NASA Parkway and SR 3 to the south (NASA, 2022b), it is assumed that KSC personnel would have access to any gate, provided it is open. Table 3-6 lists annual average daily traffic (AADT)⁵ on roadway segments near each of these access points for the years 2017-2021.

Road Segment	2017	2018	2019	2020	2021
Columbia Blvd (SR 405) to Space Commerce Way (via NASA Parkway)	12,200	12,600	11,800	11,500	11,500
N Courtenay Parkway (SR 3) from Judson Road to KSC property line	13,100	15,500	14,800	14,400	14,400
A. Max Brewer Memorial Parkway to Playalinda Road	3,100	3,100	3,100	2,200	2,200
N Courtenay Parkway (SR 3) from A. Max Brewer Memorial Parkway to Volusia County Line	350	950	950	950	1,200
Space Commerce Way from Kennedy Parkway to NASA Parkway	3,500	3,600	3,600	2,800	2,800

 Table 3-8. AADT for Roadways Providing Access to KSC

Source: (FDOT, 2022a)

The KSC Vision Plan does not identify any features of the roadway infrastructure that require upgrade or represent a critical liability. However, bridges serving KSC are close to the end of their design life and

⁵ Annual average daily traffic is the total volume of vehicle traffic on a highway or road for a year divided by 365 days. AADT is a generalized measurement to determine how busy a given segment of road is daily.

require increasing resources to support operations and maintenance activities to prolong the life of these bridges. The Vision Plan identifies the NASA Causeway Bridge and the Jay-Jay Railroad Bridge and liabilities due to age (NASA, 2020a). Current plans call for a complete replacement of both the eastbound and westbound spans of the NASA Causeway Bridge to ensure the necessary access for payloads to reach KSC. This construction is scheduled for completion in 2025 (FDOT, 2021). To support future growth by allowing the transportation of oversized space industry vehicles to launch sites, as well as regular public and commercial traffic between the mainland near Titusville and North Merritt Island, the Florida Department of Transportation plans to widen Space Commerce Way to four lanes for approximately 2.7 miles from NASA Parkway West to Kennedy Parkway (FDOT, 2022b).

Access to the SpaceX Roberts Road Operations Area can be achieved via NASA Parkway West to Kennedy Parkway North to Roberts Road heading west. As a part of the development of the existing SpaceX Roberts Road Operations Area, Roberts Road was paved from Kennedy Parkway to the western boundary of the existing operations area. Roadway further to the west remains unpaved.

3.11.2 Environmental Consequences

Impacts on ground traffic and transportation are analyzed by considering the possible changes to existing traffic conditions and the capacity of area roadways within the ROI from proposed increases in commuter and construction traffic.

A Traffic Impact Analysis (TIA) was completed for the Proposed Action. The existing SpaceX Roberts Road Operations Area and expansion is expected to generate up to approximately 5,200 trips per day based on the Institute of Transportation Engineers Trip Generation Manual.

3.11.2.1 Proposed Action

During construction associated with the Proposed Action, short-term increases in traffic would result from worker commutes and the delivery of materials to and from construction sites. Maintenance of traffic would be coordinated with NASA to ensure significant impacts do not occur during construction. Temporary lane closures along Saturn Causeway would occur during construction. The Saturn Causeway widening would not add additional travel lanes, thus there would be no appreciable change in traffic due to the project.

As related to daily operations, long-term effects would result from the shift of workers from multiple sites to one location (resulting in altered traffic patterns near the SpaceX Roberts Road Operations Area and on KSC) and the periodic transport of spacecraft components. However, this would be beneficial because it would reduce traffic within the KSC secure area. As the trips represent a reorganization of existing workers from multiple sites to one site, overall traffic to and from KSC would not be significantly impacted by the Proposed Action.

Signal timing improvements would be implemented at the Kennedy Parkway/ NASA Parkway interchange to maintain an acceptable LOS once the site is fully built out. Kennedy Parkway at Roberts Road would be signalized and the left-turn storage lengthened to accommodate the projected traffic. Table 3-7 summarizes the LOS in 2027 with and without these improvements under the Proposed Action.

Intersection	Without Improvements AM Peak Hour LOS (delay [s])	Without Improvements PM Peak Hour LOS (delay [s])	Improvements AM Peak Hour LOS (delay [s])	Improvements PM Peak Hour LOS (delay [s])
Kennedy Parkway at A. Max Brewer Memorial Parkway	A (8.5)	A (7.7)	-	-
Kennedy Parkway at Schwartz Road	B (10.3)	A (9.0)	-	-
Kennedy Parkway at Roberts Road	F (62.7)	F (782.6)	D (35.5)	C (25.7)
Kennedy Parkway at NASA Parkway Westbound On/Off Ramps	D (46.3)	A (6.0)	C (21.8)	-
Kennedy Parkway at NASA Parkway Eastbound On/Off Ramps	D (42.5)	B (11.1)	D (41.2)	-
Kennedy Parkway at Space Commerce Way	A (4.8)	A (7.7)	-	-
NASA Parkway at Space Commerce Way	B (10.4)	D (42.7)	-	D (43.9)

Table 3-9. Projected 2027 Level of Service

LOS = Level of Service; s = seconds; - denotes no change in LOS

As such, it is expected that the Proposed Action would have a long-term, indirect, minor impact on the transportation network and overall traffic flow at KSC in relation to traffic as it exists today.

3.11.2.2 Alternative 1

Alternative 1 would result in identical impacts to transportation as the Proposed Action.

3.11.2.3 No Action Alternative

Under the No Action Alternative, there would be no new facilities or construction beyond what is currently authorized in the 2018 EA, or re-designation of land use or the Spaceport Growth Boundary. Therefore, transportation conditions would remain as described in the 2018 EA and Section 3.10.1 of this document and there would be no impacts on transportation.

3.12 Utilities

Utilities, including drinking water production, storage, and distribution; wastewater collection treatment and disposal; storm water management; and energy production, transmission, and distribution, are described in this section. The ROI is KSC at-large.

3.12.1 Affected Environment

3.12.1.1 Drinking Water

Changes to the ROI since the 2018 EA

The water system at KSC remains largely unchanged from conditions described in the 2018 EA. Water at KSC is used for a variety of purposes, including drinking, cooking, and bathing, and public activities such

as lawn irrigation, firefighting, air conditioning, and construction. Commercial and industrial operations that utilize water at KSC include launch pad deluge sound suppression, pad washdown, and vehicle processing, which can place heavy demands on the public water supply. KSC uses an average of 0.58 million gallons per day with a maximum daily usage of 2.2 million gallons (NASA, 2020b).

3.12.1.2 Wastewater

Changes to the ROI since the 2018 EA

Domestic and industrial wastewater systems remain largely unchanged from conditions described in the 2018 EA. The domestic wastewater collection/transmission system at KSC has two major collection points, one located in the Industrial Area and one in the Vehicle Assemble Building Area, providing service for approximately 90 percent of NASA and contractor personnel at KSC. These systems transport raw wastewater to the CCSFS Regional Wastewater Treatment Facility. There are approximately 40 On Site Treatment and Disposal Systems (septic tanks) throughout KSC that typically support small offices or facilities too distant from existing sewer systems to tie in (NASA, 2020b).

SpaceX maintains a permit for industrial wastewater at Hangar X that allows the discharge of 0.003 million gallons per day of non-process wastewater into a stormwater pond, then a second stormwater pond, and then into a canal that leads to Oyster Prong, a waterbody within the Indian River Lagoon.

3.12.1.3 Stormwater

Changes to the ROI since the 2018 EA

The stormwater system at KSC remains largely unchanged from conditions described in the 2018 EA. KSC has 95 permitted surface water management systems to control stormwater runoff. The four largest stormwater systems at KSC are the Region I system that serves the Industrial Area, the Sub-basin 11 system that serves the western Vehicle Assembly Building Area, the Vehicle Assembly Building South system, and the LLF system. KSC manages NPDES Stormwater permits, and Multi-Sector General Permits, which covers six industrial operations at KSC. KSC does not meet the criteria established by FDEP that would categorize it as an urban area and is therefore not required to obtain a permit as a municipal separate storm sewer system (NASA, 2020b). SpaceX manages multiple NPDES stormwater permits for industrial and/or construction activities at sites across KSC/CCSFS, including LC-39A and the SpaceX Roberts Road Operations Area.

3.12.1.4 Energy

Changes to the ROI since the 2018 EA

Construction of the FPL solar farm has been completed since the 2018 EA. Otherwise, the energy system at KSC (electric and natural gas) remains largely unchanged from conditions described in the 2018 EA. Since 2008, KSC has more than doubled its solar photovoltaic energy creation from 1 MW to 2.5 MW, representing almost three percent of KSC's utility requirements.

3.12.2 Environmental Consequences

This section analyzes the magnitude of anticipated increases or decreases in utility demands considering historic levels, existing management practices, and storage capacity, and evaluates potential impacts to utilities associated with implementation of the alternatives. Impacts are evaluated by whether they would result in the use of a substantial proportion of the remaining system capacity, reach or exceed the current capacity of the system, or require development of facilities and sources beyond those existing or currently planned.

3.12.2.1 Proposed Action

Impacts on drinking water, wastewater, stormwater, and energy infrastructure at KSC under the Proposed Action would be minimal to moderate. These utilities and services are currently available at or within reasonable proximity to the Proposed Action, specifically from upgrades and connections made during the construction of the SpaceX Roberts Road Operations Area. The Proposed Action would require extension and/or connection to existing water, wastewater, electric, and gas lines. Consumption of drinking water would not be expected to substantially change as most personnel would relocate within KSC and new construction would be anticipated to include water-conserving equipment such as low-flow toilets. Domestic water would also be used for cooling processes. Total water usage would be dependent on the final design of the site, but would not be anticipated to cause significant impacts to the existing water supply.

Wastewater not listed as an approved discharge in the KSC Industrial Wastewater Inventory or approved for discharge to the CCSFS Regional Wastewater Treatment Facility would have the potential for moderate impacts. The amount of wastewater generated by the Proposed Action is not anticipated to exceed the capacity of the CCSFS Regional Wastewater Treatment Facility. If the CCSFS Regional Wastewater Treatment Facility could not accept the wastewater, it would be treated on-site or hauled off.

SpaceX would manage stormwater at the Expansion Area. Stormwater from the proposed site would not be expected to significantly contribute to overall volume at KSC. Addition of new, or alteration of existing, stormwater management systems may require modification of the SpaceX NPDES stormwater permit for industrial activities and associated SWPPP.

SpaceX expects to need an additional 10 MW service to the site to supplement the 10 MW service already in use. The proposed duct bank along Saturn Causeway would carry upgraded utility service to LC-39A. Gas would be supplied by Florida City Gas and electric would be supplied by FPL, serviced via new underground feeders running from FPL's planned Saturn Substation, south along SR 3, west along Schwartz Road, and south along Avenue A. It is assumed that this power would be bored in the existing cleared maintenance area along these roads and/or within the existing transmission easement. Some trenching would be required for the extension of existing utility lines to the proposed SpaceX expansion of the Roberts Road Operational Area, which depending on the location and size of the systems to be installed or expanded, could have direct and indirect environmental impacts.

Overall, the Proposed Action is anticipated to result in long-term, minor, direct impacts to utilities at KSC.

3.12.2.2 Alternative 1

Alternative 1 would have similar utility requirements as the Proposed Action, but would be unable to utilize existing utilities at the SpaceX Roberts Road Operations Area without additional construction. Alternative 1 would require construction of new utility farms on site and would require the extension of existing utility to cross Roberts Road, including but not limited to a new pneumatic gas farm or several thousand feet of high-pressure gas lines, a second set of transformers and electrical feeders, a second wastewater lift station, sanitary sewer network for the site and a new sanitary sewer network, and a new NASA demarcation point for communication equipment.

3.12.2.3 No Action Alternative

Under the No Action Alternative, there would be no new facilities or construction beyond what is currently authorized in the 2018 EA, or re-designation of land use or the Spaceport Growth Boundary. Therefore, no additional impacts on KSC utilities would occur and conditions would remain as described in in the 2018 EA and Section 3.11.1 of this EA.

3.13 Hazardous Materials and Hazardous Waste

A hazardous material is an item or agent (biological, chemical, radiological, and/or physical), which has the potential to cause harm to humans, animals, or the environment, either by itself or though interaction with other factors. Hazardous materials are defined and regulated primarily by laws and regulations administered by the Environmental Protection Agency, the Occupational Safety and Health Administration, the Department of Transportation, the Comprehensive Environmental Response, Compensation, and Liability Act, the Toxic Substance Control Act, the Emergency Planning and Community Right-to-Know Act, and the U.S. Nuclear Regulatory Commission.

Hazardous waste is defined in the Resource Conservation and Recovery Act as any solid, liquid, contained gaseous, or semi-solid waste, or any combination of wastes that could or do pose a substantial hazard to human health or the environment. Waste may be classified as hazardous because of its toxicity, reactivity, ignitability, corrosive properties, or listed status. All hazardous wastes generated on KSC must be managed, controlled, stored, and disposed of according to regulations found in 40 C.F.R. Parts 260 through 282 and FAC Chapter 62-730.

Hazardous materials and solid and hazardous wastes are managed and controlled in accordance with federal, state, and local regulations. KSC has established plans and procedures to implement these regulations. The use, management, and disposal of hazardous materials on KSC is further described in Kennedy NASA Procedural Requirement 8500.1 - KSC Environmental Requirements. Section 3.5.1 of the 2016 PEIS provide a detailed discussion of hazardous materials and waste at KSC. The ROI is KSC at-large.

3.13.1 Affected Environment

Changes to the ROI since the 2018 EA

Hazardous materials and waste management, pollution prevention, and spill management at KSC remain the same as described in the 2018 EA.

3.13.2 Environmental Consequences

3.13.2.1 Proposed Action

Hazardous materials and hazardous wastes utilized and generated by the Proposed Action would to be managed in accordance with federal, state, and local laws and regulations. The Proposed Action would be consistent with existing SpaceX operations, as many of these processes would be relocated from other facilities within Brevard County.

Payloads would be processed in manners similar to how they currently are at KSC/CCSFS and analyzed in the *Environmental Assessment for Launch of NASA Routine Payloads* (NASA, 2011). As described in the 2011 EA, a payload processing facility would handle both hazardous, such as hypergolic fuels, and non-hazardous materials. Each loading operation is independent, sequential and conducted using a closed-loop system. During the operation, all propellant liquid and vapors are contained. If small leaks occur during propellant loading, immediate steps are taken to stop loading, correct the leakage, and clean leaked propellant operations. Leakage is absorbed in an inert absorbent material for later disposal as hazardous waste, or aspirated into a neutralizer solution. Propellant vapors left in the loading system are routed to air emission scrubbers. Liquid propellant left in the loading system is either drained back to supply tanks or into waste drums for disposal as hazardous waste. In the case of spills or accidental releases, emergency response plans would be followed. Safety procedures would reduce the potential for an accidental release of hazardous materials. The payload processing facility would be developed and sited in consultation with NASA Safety. Associated QD arcs would be established with the KSC Explosive Siting Office prior to building construction.

Hazardous wastes would be disposed of in a manner consistent with federal, state, and local laws and regulations. The Proposed Action is not expected to generate significant quantities of hazardous waste.

The Proposed Action would result in long-term, minor, localized impacts. Through compliance with federal, state, and local laws and regulations as well as the implementation of operational safety and emergency response plans, there would be no significant impacts due to hazardous materials or hazardous waste.

3.13.2.2 Alternative 1

Siting of the payload processing facility would place either the FPL solar farm or Kennedy Parkway within the 1,250 ft quantity distance arc. All other impacts from hazardous materials and hazardous waste would be similar to those under the Proposed Action.

3.13.2.3 No Action Alternative

Under the No Action Alternative, there would be no new facilities or construction beyond what is currently authorized in the 2018 EA, or re-designation of land use or the Spaceport Growth Boundary. Therefore, there would be no impacts due to hazardous materials or hazardous waste.

4 Mitigation

In addition to construction BMPs described in Section 3, SpaceX would implement the following mitigation measures to reduce potential impacts from the Proposed Action.

4.1 Florida Scrub-Jay

The Proposed Action would require implementation of the measures described in the KSC Florida Scrub-Jay Compensation Plan to compensate for impacted auxiliary and/or support FSJ habitat. These measures may include, but are not limited to, habitat creation or restoration, mechanical treatment of habitat, and experimental approaches using frequent mosaic fires.

Impacts to auxiliary habitat would be mitigated at a 1:1 ratio for areas adjacent to development and 2:1 ratio for areas not adjacent to development. Impacts to support habitat would be mitigated at a 2:1 ratio for areas adjacent to development and a 4:1 ratio for areas not adjacent to development. After the KSC Environmental Management Branch determines the total amount of mitigation, biologists with MINWR and the KSC Ecological Program would determine the best areas within MINWR for compensatory habitat restoration using the potential territory grid model. Use of this model would allow for the selection of locations that would have the greatest population benefit. Use of this model would also allow for the quantification of FSJ families expected to be positively impacted by restoration.

Following USFWS concurrence with the proposed mitigation areas, KSC and SpaceX would coordinate to ensure MINWR receives sufficient funding to conduct the compensatory mitigation. Funding would be determined based on the total restoration acreage multiplied by the restoration cost per acre.

4.2 Water Resources

The Proposed Action would require implementation of mitigation to obtain a State 404 permit from FDEP under the CWA if needed, and an Environmental Resource Permit from the SJRWMD. The amount of required mitigation is determined through the Uniform Mitigation Assessment Method (UMAM), which uses ecological principles to calculate functional loss and gain. FDEP and SJRWMD verify project UMAM scores for wetlands within their respective jurisdictions.

Mitigation type is determined using the mitigation hierarchy as described in the Florida State 404 Program Applicant's Handbook (FDEP, 2020). Compensatory mitigation should be located within the same watershed as the impact site and should be located where it is most likely to successfully replace lost functions and services. When a project is within a mitigation bank service area, and credits are available, mitigation bank credits are generally prioritized over other types of mitigation. Where mitigation bank or in-lieu fee program credits are unavailable, permittee-responsible mitigation is utilized. Permittee-responsible mitigation would utilize the above mitigation methods to maintain and improve the quality and/or quantity of aquatic resources within a watershed through the strategic selection of mitigation sites. If acquiring an appropriate site(s) for permittee-responsible mitigation within the watershed is not practicable, an applicant might explore out of watershed mitigation strategies subject to approval by the regulatory agencies.

In order to replace the lost wetland functions of impacted wetlands and surface waters, SpaceX would execute a multifaceted approach. First, SpaceX would obtain available credits through the FDEP and SJRWMD mitigation bank credit program. For impacts to Waters of the United States and Waters of the State that cannot be mitigated through the FDEP and SJRWMD mitigation bank credit program, SpaceX would prepare a permittee-responsible mitigation plan that could include out of watershed mitigation strategies.

If credits are unavailable or cannot be used to mitigate, SpaceX's permittee-responsible mitigation plan would be intended to maintain and improve the quality and/or quantity of aquatic resources through the strategic selection of mitigation sites. SpaceX's permittee-responsible mitigation plan would consider the importance of landscape positions and how the type and location of mitigation would provide the desired aquatic resource functions and would continue to function over time in a changing landscape. It would also consider the habitat requirements of important species, habitat loss or conversion trends, sources of watershed impairment, and current development trends. Hydrology and surrounding land uses are important to the success of mitigation for impacted habitat functions and influence the siting of mitigation. The compensatory mitigation is intended to provide the suite of functions typically provided by the affected aquatic resource.

SpaceX's mitigation plan would involve the enhancement, restoration, creation, and/or preservation of aquatic resources that would serve to offset unavoidable impacts:

- Enhancement heightens, intensifies, or improves a specific aquatic resource function(s) and results in the gain of the selected aquatic resources function(s), but may also lead to a decline in other function(s).
- **Restoration** returns the natural and/or historic functions to a former or degraded aquatic resource. Restoration is accomplished through either reestablishment or rehabilitation. Reestablishment rebuilds a former aquatic resource and results in a gain to the aquatic resource area and function. Rehabilitation repairs a former aquatic resource and results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.
- **Creation** establishes a new aquatic resource in an upland site and results in a gain in aquatic resource area and functions.
- **Preservation** removes a threat to or prevents the decline of aquatic resources through the implementation of appropriate legal and physical mechanisms and does not result in gain of aquatic resource area or functions.

Prior to construction, SpaceX would require agency approval from the FDEP and/or SJRWMD on the mitigation plan as part of the permit process. Following construction, the mitigation site(s) would be monitored to demonstrate that the project has met the required performance standards. The ecological benefits of the mitigation compensate for the functional loss resulting from the permitted impact.

5 Cumulative Impacts

This section: (1) defines cumulative impacts; (2) describes past, present, and reasonably foreseeable future actions relevant to cumulative impacts; (3) analyzes the incremental interaction the Proposed Action may have with other actions; and (4) evaluates cumulative impacts potentially resulting from these interactions. The approach taken in the analysis of cumulative impacts follows the objectives of NEPA, CEQ regulations (Council on Environmental Quality, 1997), and CEQ guidance (Council on Environmental Quality, 2005). Cumulative effects are defined in 40 C.F.R. Section 1508.1(g)(3) as "effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of which (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time."

To determine the scope of environmental impact analyses, agencies shall consider cumulative actions, which when viewed with other proposed actions have cumulatively significant impacts and should therefore be discussed in the same impact analysis document. 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 close to 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:

- Does a relationship exist such that affected resource areas of the Proposed Action might interact with the affected resource areas of past, present, or reasonably foreseeable actions?
- If one or more of the affected resource areas of the Proposed Action and another action could be expected to interact, would the Proposed Action affect or be affected by impacts of the other action?
- If such a relationship exists, then does an assessment reveal any potentially significant impacts not identified when the Proposed Action is considered alone?

The scope of the cumulative impacts analysis involves both the geographic extent of the effects and the time frame in which the effects could be expected to occur. For this SEA, the study area includes those areas previously identified in Section 3 (Affected Environment and Environmental Consequences) for the respective resource areas. The time frame for cumulative impacts centers on the timing of the Proposed Action. Another factor influencing the scope of cumulative impacts analysis involves identifying other actions to consider. Beyond determining that the geographic scope and time frame for the actions interrelate to the Proposed Action, the analysis employs the measure of "reasonably foreseeable" to include or exclude other actions. For the purposes of this analysis, public documents prepared by federal, state, and local government agencies form the primary sources of information regarding reasonably foreseeable actions.

5.1 Projects Considered for Potential Cumulative Effects

Future land use development at KSC promotes efficient use of land area resources balanced with an understanding of development suitability and capacity. This section focuses on past, present, and reasonably foreseeable future projects at and near the Proposed Action locale. In determining which projects to include in the cumulative impact analysis, a preliminary determination was made regarding the past, present, or reasonably foreseeable action. Specifically, using the first fundamental question included in this section, it was determined if a relationship exists such that the affected resource areas of the Proposed Action might interact with the affected resource area of a past, present, or reasonably foreseeable future action. If no such potential relationship exists, the project was not carried forward into the cumulative impact analysis. These actions considered but excluded from further cumulative effects analysis are not cataloged here as the intent is to focus the analysis on the meaningful actions relevant to informed decision-making. Projects in the region that posed temporary impacts only during construction but are now complete are listed in Table 5-1. In addition, the table includes projects scheduled for the near-term that would only pose temporary construction impacts but would not contribute to any permanent increase in impacts. None of these projects are carried forward for cumulative analysis because:

no additional permanent impact would be expected to occur; or

• the project impacts are already incorporated into the affected environment described for each resource area.

Location	Action Name	Description
Past Actions that had	omplete	
KSC	LC-39B Redevelopment for Space Launch	LC-39B was redeveloped for
	System	the SLS rocket and Orion
		spacecraft. The pad was
		returned to a clean design
		after removal of the Fixed
		Service Structure.
		Conceptually, this design
		allows multiple types of
		vehicles to launch from LC-39B
		arriving at the pad with service
		structures on the mobile
		launch platform rather than
		custom structures on the pad.
KSC	KSC Central Campus Redevelopment	The area was identified to
		support any nonhazardous
		new NASA development in
		support of NASA programming
		and/or as part of the KSC's
		recapitalization process.

Tabl	e 5-1.	Cumula	tive Actio	ons with T	emporary	Constru	ction Impacts

Location	Action Name	Description
		Facilities were relocated here
		through recapitalization
		efforts.
CCSFS	Blue Origin Construction of LC-36	Blue Origin constructed a
		launch site and supporting
		facilities necessary for Orbital
		Launch Vehicles (DOT, 2017).
KSC	Blue Origin Manufacturing and Production	Blue Origin built a
	Campus in Exploration Park	manufacturing facility to
		support development of
		reusable launch vehicles
		utilizing rocket-powered
		Vertical Take-off and Vertical
		Landing systems.
CCSFS	Relativity Redevelopment of LC-16	To support the Terran 1
		Program, modification of
		existing facilities and
		construction of new systems
		and facilities were conducted
		at LC-16 (USAF, 2020).

Key: CCSFS = Cape Canaveral Space Force Station; KSC = Kennedy Space Center; LC = Launch Complex; SLS = Space Launch System.

If the projects pose ongoing impacts (e.g., air emissions, vessel traffic) then they are included in the cumulative analysis. All projects included in this cumulative impact analysis are listed in Table 5-2 and briefly described in the following subsections.

Table	5-2	Cumul	ative	Action	Evaluation
Iable	· J-Z.	Cumu	alive	ACTION	Lvaluation

Location	Action	Description	Potentially Impacted
			Resources
Past Actions	3		
KSC	KSC Transition to Multi-User	As noted in the 2018 EA, KSC's	Land Use
	Spaceport	transition to a multi-user	Biological
		spaceport, as addressed in the	Resources
		2016 Master Plan EIS, advocates	Cultural
		compatible relationships	Resources
		between adjacent land uses. In	Air Quality
		addition, the 2020 Vision Plan	Climate
		and Programmatic EA supports	Water
		KSC's mission to function as a	Resources
		multi-user spaceport for launch	Geology and
		operations by NASA and private	Soils
		partners. As such, development	Transportation
		within KSC focuses on	Utilities
		maintaining effective real	

Location	Action	Description	Potentially Impacted Resources		
		property management through sustainable planning (NASA, 2016).			
Present Act	Present Actions				
KSC	Starship/Super Heavy at LC-39A	SpaceX operates its Falcon family of launch vehicles at LC- 39A and plans to expand operations to include launch of a Starship/Super Heavy vehicle from this complex (i.e., up to 24 times per year) (NASA, 2019b). In support of this action, SpaceX is constructing a Starship/Super Heavy launch mount and integration tower and installing ground support equipment. Site improvements include an interior transport road and several new high-pressure gaseous commodity lines.	Biological Resources Cultural Resources Air Quality Climate Water Resources Geology and Soils Transportation Utilities		
KSC	SpaceX Roberts Road Operations Area	The ongoing construction associated with the 2018 EA includes site development of approximately 67 acres of land (NASA, 2018a). Roberts Road and A Avenue were paved.	Land Use Biological Resources Air Quality Climate Water Resources Geology and Soils Transportation Utilities		
KSC	Blue Origin Manufacturing and Production Campus in Exploration Park	Blue Origin operates a manufacturing facility to support development of reusable launch vehicles utilizing rocket-powered Vertical Take-off and Vertical Landing systems.	Land Use Biological Resources Air Quality Climate Water Resources Geology and Soils Transportation Utilities		
CCSFS	Space Florida Redevelopment of SLC-20	Space Florida is developing, refurbishing, enhancing and	Land Use		

Location	Action	Description	Potentially Impacted
			Resources
		using approximately 220 acres at Cape Canaveral Space Force Station, including SLC-20 and all	Biological Resources Cultural
		Florida, 2020). Action includes construction/renovation activities and operation of small- and medium-lift launch vehicles.	Air Quality Climate Water Resources Geology and Soils Utilities
KSC	Space Florida LLF Development	Space Florida is developing and improving the area around the LLF to support commercial activities (NASA, 2021).	Land Use Biological Resources Air Quality Climate Water Resources Geology and Soils Transportation Utilities
KSC	Space Commerce Way Widening	FDOT is widening 2.7 miles of Space Commerce Way to four lanes to support future growth at KSC. The project began construction in July 2023.	Land Use Biological Resources Air Quality Climate Water Resources Geology and Soils Transportation
Reasonably	Foreseeable Future Actions		
KSC/CCSFS	SpaceX Starship/Super Heavy Operations	SpaceX is evaluating the feasibility of constructing a proposed new launch complex to support Starship/Super Heavy launch operations. The proposed launch site would provide redundancy and capacity and allow SpaceX to increase the flight rate of Starship and minimize potential disruptions	Land Use Biological Resources Cultural Resources Air Quality Climate Water Resources Geology and

Location	Action	Description	Potentially
			Resources
		Dragon missions at LC-39A (NASA, 2022c).	
CCSFS	United States Space Force Range of the Future	The U.S. Space Force plans to update Cape Canaveral in terms of infrastructure and processes over the next decade, clearing the way to accommodate potential daily launches for everything from manned spaceflight to military and commercial communications and surveillance payloads (Cohen, 2020). As part of this effort, Space Launch Delta 45 is currently working on increasing its launch posture over the next 10 years through a collection of work called the Range of the Future, which includes improvements to infrastructure, operations and policies, continuously developing and deploying new technology, and innovating at every level (USAF, 2021).	Land Use Biological Resources Cultural Resources Air Quality Climate Water Resources Geology and Soils Transportation Utilities
KSC	Starship/Super Heavy at LC-39A	As noted under present actions, SpaceX plans to expand operations to include launch of a Starship/Super Heavy vehicle from this complex (i.e., up to 24 times per year) (NASA, 2019b). Launch operations will occur following completion of infrastructure site improvements (anticipated Quarter 3 of 2023).	Biological Resources Cultural Resources Air Quality Climate Water Resources Geology and Soils Utilities
KSC/CCSFS	SpaceX Falcon Program at LC-39A and SLC-40	SpaceX intends to continue implementation of the Falcon 9 program at KSC and CCSFS. SpaceX intends to conduct up to 70 annual launches for the reasonably foreseeable future (FAA, 2020).	Biological Resources Air Quality Climate

Location	Action	Description	Potentially Impacted Resources
KSC/CCSFS	Other launch operations	 Atlas V and Vulcan launches from SLC-41 Relativity launches from SLC-16 Blue Origin launches from SLC-36 SLS launches from LC-39B Sierra Space Dream Chaser landings at the LLF Astra launches from SLC-46 Firefly launches from LC-20 Stoke Space launches from LC-14 ABL Space System launches from LC-15 Phantom & Vaya launches from LC-13 	Biological Resources Cultural Resources Air Quality Climate
KSC	Solar Development	A solar field and stormwater treatment are proposed at the intersection of Schwartz Road and A Avenue. The project is expected to begin construction in 2023.	Land Use Biological Resources Cultural Resources Water Resources Geology and Soils Utilities
KSC	Natural Gas Pipeline	A natural gas pipeline operated by Florida City Gas is proposed to provide natural gas to KSC. The project is expected to begin construction in 2024 and be built in phases.	Land Use Biological Resources Cultural Resources Water Resources Geology and Soils Utilities

Key: CCSFS = Cape Canaveral Space Force Station; EA = Environmental Assessment; FDOT = Florida Department of Transportation; KSC = Kennedy Space Center; LC = Launch Complex; LLF = Launch and Landing Facility; LZ = Landing Zone; NEPA = National Environmental Policy Act; SLC = Space Launch Complex; SLS = space launch system; SpaceX = Space Exploration Technologies.

5.2 Cumulative Impact Analysis

Cumulative impacts result from the incremental effect of an action when added to other past, present, and reasonably foreseeable future actions, regardless of the proponent undertaking these actions. Minimal or negligible impacts from individual projects may, over a period of time, become collectively significant. Where feasible, the cumulative impacts were assessed using quantifiable data; however, for many of the resources included for analysis, quantifiable information is not available, and a qualitative analysis was undertaken. In addition, where an analysis of potential environmental effects for future actions has not been completed, assumptions were made regarding cumulative impacts related to this SEA where possible. The analytical methodology presented in Section 3 (Affected Environment and Environmental Consequences), which was used to determine potential impacts to the various resources analyzed in this document, was also used to determine cumulative impacts.

5.2.1 Land Use/Visual Resources

5.2.1.1 Proposed Action

Potential cumulative impacts on land use resulting from the past, present, and reasonably foreseeable future actions identified in Table 5-2 are primarily associated with land use designation changes, reduced wildlife habitat, and reduced land area managed by prescribed burning. In the context of these actions, development of the Expansion Area would be expected to have a moderate cumulative impact on land use due to its location outside the existing Spaceport Growth Boundary, the undeveloped nature of the area, and the required change in land use designation. Development of the proposed Roberts Road site, in combination with other development on KSC, would cumulatively contribute to a reduction in the total land area managed by prescribed burns. Reductions in prescribed burns may potentially result in longterm effects on land use, particularly wildlife management practices. However, KSC regularly coordinates with the USFWS and MINWR to ensure there are minimal operational impacts to the management of MINWR, including fire management operations, restrictions to the prescribed burning program, and potential impacts to protected species. Land use category changes on KSC generally require development of a site plan and land use change request, which is vetted through the Master Plan Amendment Process. Land at the proposed expansion area is currently managed by MINWR for wildlife and habitat diversity. However, in the context of the time period covered by the KSC Master Plan (2012 to 2032) (NASA, 2016), relatively few natural areas on KSC have been converted or are planned for conversion to operational use.

Potential cumulative impacts on visual resources would primarily consist of security lighting and facilities placement. Lighting at all new facilities, including facilities associated with the actions identified in Table 5-1 and Table 5-2, would be installed and operated according to applicable KSC guidelines. KSC reviews new facility site plans to identify potential constraints. New facilities, although potentially visible at various distances, are generally consistent with the industrial nature of existing infrastructure on KSC.

NASA reviews all proposed actions at KSC for consistency with the Florida Coastal Management Plan. The reviews are intended to ensure that actions do not result in significant impacts on coastal resources.

Overall, cumulative impacts on land use would be moderate and easily absorbed by consolidation of operations into areas with compatible uses during future land use planning. No significant adverse

cumulative impacts to visual resources or coastal zone management would occur as a result of the Proposed Action.

5.2.1.2 Alternative 1

Alternative 1 would result in cumulative impacts to land use and visual resources similar to those under the Proposed Action.

5.2.2 Biological Resources

5.2.2.1 Proposed Action

As described in the 2020 KSC Vision Plan, to the greatest extent possible development at KSC is concentrated in areas that minimize impacts to wetlands and protected species. The Proposed Action and the actions in Table 5-2 involve the clearing of native upland habitat and the clearing and/or filling of a limited amount of wetland habitat. Compensatory mitigation would be required for such activities in wetlands, and all construction projects would follow BMPs and permit requirements to prevent excess sedimentation and runoff into surrounding habitats. Cumulative wetland habitat destruction and fragmentation may negatively affect the breeding, roosting, or foraging of certain individuals, particularly those with limited mobility and those without corridors to other suitable habitat. However, KSC and MINWR do have large areas of intact wetlands where some displaced wetland dependent species may establish new home territories. Section 7 requirements from the USFWS and the requirement to avoid the nests of bald eagles, migratory birds, and other protected bird species until they have fledged would further reduce the potential for major cumulative impacts to these species.

For wildlife species with populations that are currently well-distributed and not stressed by other factors across KSC, cumulative habitat loss and disturbance impacts from the Proposed Action and the activities in Table 5-2 are expected to be minimal. However, for protected species, the potential for negative impacts is greater due to the rarity of these animals and their habitats. For example, if restrictions on prescribed burning at KSC, MINWR, and CCSFS from the actions listed in Table 5-2 were to occur such that fire-dependent habitats were not burning frequently enough to maintain quality conditions in large areas of connected habitat, then there would likely be decreases in the health of FSJs, indigo snakes, gopher tortoises, and other species that require fire-dependent habitats. Due to the importance of the FSJ population at KSC, such a cumulative decrease in FSJ numbers could be considered significant. However, KSC, MINWR, and CCSFS are committed to ensuring that FSJ habitat is burned in such a way that the long-term health of FSJs is maintained and improved, as detailed in the *Prescribed Fire MOU* (45 SW, USFWS, and KSC, 2019), *MINWR Comprehensive Conservation Plan* (USFWS, 2008), and CCSFS Integrated Natural *Resources Management Plan 2021* (USSF, 2021). Additionally, if impacts could not be avoided then compensatory mitigation credits for FSJs likely would be required through Section 7 consultation with the USFWS.

With continuing development, growing numbers of spacecraft launches and landings, and the associated increases in traffic, the incidences of wildlife collisions and harassment from noise, visual disturbances, and lighting are expected to increase by varying degrees. Although some level of incidents would be unavoidable, wildlife warning signs, enforced speed limits, and educational measures may help prevent some wildlife strikes from the increase in traffic, and the number of bird collisions would likely be reduced
by requiring facilities to follow applicable FAA guidelines and USFWS guidelines for towers and buildings (USFWS, 2021b; USFWS, 2021c). As all facilities at KSC are required to develop and follow a Lighting Management Plan to reduce the potential for disorientation of sea turtles, the Proposed Action and other development actions in Table 5-2 would contribute a minimal amount of artificial lighting to the area. Compared to the increased number of launches and landings described in Table 5-2, the Proposed Action would contribute a relatively small degree of noise and visual disturbance to wildlife.

Overall impacts to vegetation, habitats, wildlife, and protected species would be moderated by the implementation of KSC requirements, compensatory mitigation credits, mitigations, and USFWS Section 7 terms and conditions. When the Proposed Action is considered in combination with the actions in Table 5-2, the expected cumulative impacts to biological resources would be minor to moderate, adverse, and short-term to long-term in nature; however, they would not reach a cumulatively significant level because wetland mitigation would be completed in accordance with permit requirements and the continued existence of no federally listed species would be jeopardized.

5.2.2.2 Alternative 1

Alternative 1 would result in cumulative impacts to biological resources similar to those under the Proposed Action.

5.2.3 Cultural Resources

5.2.3.1 Proposed Action

The Proposed Action would not result in direct or indirect impacts to cultural resources. Accordingly, cumulative impacts on cultural resources would be minimal at KSC. Future projects at KSC would continue to comply with Section 106 of the NHPA, KSC Cooperative Agreement 4185 and ICRMP, and all other relevant statutes and regulations. Therefore, there would be no cumulatively significant impact to cultural resources.

5.2.3.2 Alternative 1

Alternative 1 would result in cumulative impacts to cultural resources similar to those under the Proposed Action.

5.2.4 Air Quality

5.2.4.1 Proposed Action

Cumulative impacts on air quality that would occur with the implementation of the Proposed Action and past, present, and reasonably foreseeable future projects at KSC are anticipated to be minor and adverse. As described in the 2016 PEIS, the State of Florida maintains a State Implementation Plan to inventory, implement, maintain, and enforce NAAQs under the Clean Air Act. No identified projects, in conjunction with the Proposed Action, are anticipated to interfere with the region's ability to stay in attainment or lead to violations of air quality regulations. Therefore, there would be no cumulatively significant impact on air quality.

5.2.4.2 Alternative 1

Alternative 1 would result in cumulative impacts to air quality similar to those under the Proposed Action.

5.2.5 Climate

5.2.5.1 Proposed Action

Cumulative impacts on climate that would occur with the implementation of the Proposed Action and past, present, and reasonably foreseeable future projects at KSC are anticipated to be minor and adverse. GHG emissions from the Proposed Action would be negligible when added to the cumulative global emissions. As described in the 2016 PEIS, KSC continues to identify and implement mitigation measures to reduce GHG emissions. Accordingly, there would be no cumulatively significant impact on climate.

5.2.5.2 Alternative 1

Alternative 1 would result in cumulative impacts to climate similar to those under the Proposed Action.

5.2.6 Water Resources

5.2.6.1 Proposed Action

Cumulative water resources impacts that would occur with implementation of the Proposed Action and the other projects could include increased sedimentation to area surface waters from ground disturbance, increased stormwater runoff from new impervious surfaces, and changes to wetland values and functions from wetland conversion and fill.

Cumulative impacts on water resources from past, present, and future actions within the ROI would be less than significant because BMPs to control stormwater runoff, erosion, and sedimentation would be used throughout all phases of construction for each project. Adherence to permit conditions would reduce impacts and mitigation would compensate wetland losses. It should be noted that each project at KSC that results in the fill of wetlands that requires compensatory mitigation would reduce the amount of wetland mitigation credits available (NASA, 2020b). Development of these areas could potentially impede future development elsewhere at KSC unless other areas are identified as advanced ecological mitigation sites to offset. Future projects may not be able to be permitted due to lack of available credits. When the Proposed Action is considered in combination with the actions in Table 5-2, the expected cumulative impacts to water resources would be minor to moderate, adverse, and short-term to long-term in nature; however, they would not reach a cumulatively significant level because of BMP implementation, wetland compensation/mitigation, and adherence to all other permit conditions and requirements.

5.2.6.2 Alternative 1

Alternative 1 would result in cumulative impacts to water resources similar to those under the Proposed Action.

5.2.7 Geology and Soils

5.2.7.1 Proposed Action

Cumulative impacts on geology and soils at KSC that would occur with the implementation of the Proposed Action and past, present, and reasonably foreseeable future projects at KSC are anticipated to be minor and adverse. As described in the 2016 PEIS, maintenance and development of facilities at KSC as well as land management practices may cause soil compaction, runoff into local streams, and erosion amongst other potential impacts. However, the cumulative effects of these actions would be small when compared to past, present, and reasonably foreseeable future actions and as such would not be cumulatively significant.

5.2.7.2 Alternative 1

Alternative 1 would result in cumulative impacts to geology and soils similar to those under the Proposed Action.

5.2.8 Transportation

5.2.8.1 Proposed Action

Cumulative impacts on transportation that could occur with implementation of the Proposed Action and the other projects would include increased traffic on roadways and/or degradation of roadway conditions, either at KSC or the regional roadway network. Actions that result in new construction of roadway or other transportation infrastructure could result in improved traffic conditions, including reduced congestion and more efficient traffic flow. Increases in traffic to the regional and KSC road network during construction of the Proposed Action would be temporary and would result in only minimal adverse effects. Increases in traffic from the operational phase of the Proposed Action would result in increased traffic flow to/from and on KSC and a slight modification of overall traffic patterns on KSC. Any changes in traffic patterns due to operations would be minimal and primarily localized, concentrated on KSC, and not expected to result in cumulative impacts to regional transportation. Therefore, implementation of the Proposed Action combined with the past, present, and reasonably foreseeable future projects, would not result in significant impacts to transportation.

5.2.8.2 Alternative 1

Alternative 1 would result in cumulative impacts to transportation similar to those under the Proposed Action.

5.2.9 Utilities

5.2.9.1 Proposed Action

Cumulative impacts on utilities because of Proposed Action activities combined with current and future KSC actions would be minimal to moderate. Proposed changes to utility services such as electrical, communications, natural gas, and solid waste resulting in increased demand or volumes would occur within the existing KSC site and would thus have a relatively small cumulative impact on utility service

providers when viewed from a site-wide or local perspective. The Proposed Action would not result in demand on utilities that exceeds existing or planned capacities. As commercial development at KSC grows, the CCSFS Wastewater Treatment Facility could reach its capacity by 2028 (NASA, 2020a). The Indian River Lagoon Council completed a feasibility study in early 2023 to evaluate current and future needs of the CCSFS Wastewater Treatment Facility. Because the Proposed Action would not result in the exceedance of the CCSFS Wastewater Treatment Facility capacity, and because advanced planning is being conducted to appropriately address the future needs of the CCSFS Wastewater Treatment Facility needs of the CCSFS Wastewater Treatment Facility capacity, and because advanced planning is being conducted to appropriately address the future needs of the CCSFS Wastewater Treatment Facility implementation of the Proposed Action combined with the past, present, and reasonably foreseeable future projects would not result in significant impacts to utilities.

5.2.9.2 Alternative 1

Alternative 1 would result in cumulative impacts to utilities similar to those under the Proposed Action.

5.2.10 Hazardous Materials and Hazardous Waste

5.2.10.1 Proposed Action

Cumulative impacts on hazardous materials and hazardous waste that would occur with the implementation of the Proposed Action and past, present, and reasonably foreseeable future projects at KSC are anticipated to be minor and adverse. Management of hazardous materials and hazardous waste would continue to be conducted under all federal, state, and local laws and regulations. Best management practices would continue to be implemented to reduce the potential for impacts due to an inadvertent release of hazardous materials. Therefore, there would be no cumulatively significant impact on air quality.

5.2.10.2 Alternative 1

Alternative 1 would result in cumulative impacts to hazardous materials and hazardous waste similar to those under the Proposed Action.

6 List of Preparers and Contributors

The following persons prepared the SEA and provided insight into specific resource areas.

NAME	TITLE	AREA OF CONTRIBUTION			
SpaceX					
Elyse Procopio	Senior Environmental	Quality Control			
B.S. Natural Resources	Engineer				
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Raty Groom, P.E.	Nanager, Environmental	Quality Control			
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Kalsov Condoll	Environmental Engineer	Quality Control			
M S Biology	Livioninenta Ligineer	Quality control			
B S. Wildlife and Eisberies Conservation Biology					
Years of Experience: 11					
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B.S. Civil Engineering	5				
Years of Experience: 7					
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B.S. Biomedical Science					
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M.S. Biology		Resources			
B.S. Biology					
B.S. Business Administration					
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B.S. Geology					
M.A. English					
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NAME	TITLE	AREA OF CONTRIBUTION
Vincent Passaro, QEP	Environmental Scientist	Water Resources
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Carmen Ward, P.E., PMP	Technical Lead	Quality Control
M.S. Environmental Engineering		
B.S. Chemical Engineering		
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Appendix A: Agency Consultations Section 106 Consultation

National Aeronautics and Space Administration

John F. Kennedy Space Center Kennedy Space Center, FL 32899



August 8, 2022

Reply to Attn of: SI-E3

Florida Division of Historical Resources & State Historic Preservation Officer Attn: Scott Edwards 500 S. Bronough Street R. A. Gray Building Tallahassee, Florida 32399-0250

Subject: Cultural Resource Assessment Survey of the Roberts Road North Expansion Area and NASA Parkway Connector at Kennedy Space Center and Finding of No Adverse Effect

In June 2022, SEARCH, Inc. conducted a Phase I Cultural Resource Assessment Survey (CRAS) on the Roberts Road North Expansion Area and NASA Parkway Connector at Kennedy Space Center for SpaceX. The scope of the project includes the expansion of the SpaceX operations area along Roberts Road (@ 102 acres) and the construction of a new road between Roberts Road and NASA Parkway (@ 80 acres). This project qualifies as a Federal Undertaking subject to review under Section 106 of the National Historic Preservation Act (NHPA) of 1966 and its implementing regulations (36 CFR 800). The survey was conducted in order to identify potential historic properties that meet the National Register of Historic Places (NRHP) criteria.

The Area of Potential Effects (APE) consists of an archaeological APE and an architectural APE. The archaeological APE includes the two project footprints, and the architectural APE is defined as a 1.6 km (1.0 mi) buffer around the Roberts Road north expansion area plus the footprint of the NASA Parkway connector. The APE is illustrated in the enclosed report in Figure 2.

Based on Archaeological Consultants, Inc. (ACI) 1991 *Archaeological Survey to Establish Zones of Archaeological Potential (ZAPS) in the Shuttle Landing and KSC South Area (Option 2) of the Kennedy Space Center,* the project area was determined to have low potential for the presence of unrecorded archaeological resources. LiDAR and visual inspection of the APE confirmed that the existing roads within the project areas are constructed along built-up embankments and that terrain beyond the roadways is characterized by near-total inundation and thick, hydric vegetation. One shovel test was conducted in a dry area with possible natural ground surface along the east boundary of the Roberts Road north expansion area. No artifacts were identified in the shovel test nor found on the ground surface in areas that underwent visual inspections. NASA KSC agrees with SEARCH, Inc.'s determination that the archaeological APE does not have the potential to contain significant archaeological sites and that no further archaeological investigation is necessary within the archaeological APE.

Architectural survey resulted in the identification and evaluation of five historic resources within the architectural APE, which include three previously recorded resources and two newly recorded resources. Previously recorded NRHP-eligible resources include the NASA Railroad at KSC (8BR02931), the NASA KSC Railroad System Historic District (8BR02932), and the SRB ARF Manufacturing Building #L6-0247 (8BR01998). The newly recorded resources include the Roberts Road Footbridge (8BR04443), a small footbridge crossing the ditch on the north side of Roberts Road, and one communication tower (8BR04444) on the south side of Schultz Road. NASA KSC agrees with SEARCH, Inc. that the newly recorded Resources 8BR04443 and 8BR04444 are not eligible for listing in the NRHP and that the proposed project will not adversely affect previously recorded NRHP-eligible Resources 8BR01998, 8BR02931, and 8BR02932.

NASA KSC requests your concurrence with its determination that newly recorded Resources 8BR04443 and 8BR04444 are not eligible for listing in the NRHP and its No Adverse Effect finding for the project. If you have any questions or require further assistance, please contact me at 321-867-8454.

Katherine Zeringue Digitally signed by Katherine Zeringue Date: 2022.08.09 15:32:50 -04'00'

Katherine Zeringue KSC Cultural Resources Manager Enclosure:

Cultural Resources Assessment Survey for the Roberts Road North Expansion Area and NASA Parkway Connector at Kennedy Space Center

cc: HQS FPO/R. Klein KSC/AD/S. Gilmore KSC/CC/A. Vinson KSC/SI-C2/R. Griffin FWS/T. Penn NPS/J. Grass NPS/K. Kneifl

Consulting Parties: CCSFS/MS-9125/T. Penders Spacewalk Hall of Fame North Brevard Historical Society Air Force Space and Missile Museum Brevard County Historic Commission Apollo One Memorial Foundation North Brevard Heritage Foundation Veterans Memorial Foundation



FLORIDA DEPARTMENT Of STATE

RON DESANTIS Governor **CORD BYRD** Secretary of State

November 3, 2022

Katherine Zeringue, Cultural Resources Manager John F. Kennedy Space Center Spaceport Integration & Services Environmental Management Branch, SI-E3 Kennedy Space Center, FL 32899

RE: DHR Project File No.: 2022-6435 Cultural Resources Assessment Survey for the Roberts Road North Expansion Area and NASA Parkway Connector at Kennedy Space Center Brevard County, Florida

Dear Ms. Zeringue:

Our office reviewed the referenced project in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations in 36 CFR Part 800: Protection of Historic Properties, and Chapters 267.061, Florida Statutes, and implementing state regulations, for possible effects on historic properties listed in, or eligible for, the National Register of Historic Places (NRHP), or otherwise of historical, architectural, or archaeological value. The project is subject to compliance with requirements for the National Aeronautics and Space Administration (NASA).

In October 2021 and May 2022, SEARCH conducted the above referenced Phase I cultural resource assessment survey (CRAS) on behalf of Space Exploration Technologies. During the survey, SEARCH excavated one shovel test within the Roberts Road north expansion area, and the remainder of the project area was visually inspected from accessible points. SEARCH found no evidence of archaeological resources within the shovel test or during visual inspection.

The architectural survey resulted in the identification and evaluation of four resources within the architectural APE, including two previously recorded resources and two newly recorded resources. The two previously recorded resources include the NASA Railroad at KSC (8BR02931) and the NRHP-eligible SRB ARF Manufacturing Building #L6-0247 (8BR01998). It is SEARCH's opinion that the proposed project poses no adverse effect to the NRHP-eligible Resource 8BR01998. The NASA Railroad at KSC (8BR02931) is not individually eligible for listing in the NRHP, though it is eligible where it contributes to the associated NASA KSC Railroad System Historic District (8BR02932). SEARCH found that the NRHP-eligible historic district (8BR02932) was incorrectly mapped within the APE in the Florida Master Site File database. As originally documented, the eligible historic district does not extend south of Schwartz Road outside of the APE. The portion of the railroad (8BR02931) within the APE therefore does not contribute to the eligibility of the district (8BR02932).

The newly recorded resources include one bridge (8BR04443) and one tower structure (8BR04444). SEARCH recommended Resources 8BR04443 and 8BR04444 as ineligible for listing in the NRHP. In summary, SEARCH recommends a finding of no adverse effects to historic properties as a result of the project. Further, SEARCH recommended no further cultural resource work.

Division of Historical Resources R.A. Gray Building • 500 South Bronough Street• Tallahassee, Florida 32399 850.245.6300 • 850.245.6436 (Fax) • FLHeritage.com



Ms. Zeringue DHR Project File No.: 2022-6435 November 3, 2022 Page 2

NASA KSC agrees with SEARCH, Inc. that the newly recorded Resources 8BR04443 and 8BR04444 are not eligible for listing in the NRHP and that the proposed project will not adversely affect previously recorded NRHP eligible resources 8BR01998, 8BR02931, and 8BR02932.

Based on the information provided, our office concurs with the presented survey results and recommendations. We concur with NASA that the proposed project will have no effect on historic properties listed, or eligible for listing, on the NRHP, or otherwise of historical, architectural, or archaeological value. Further, we find the submitted report complete and sufficient in accordance with Chapter 1A-46, Florida Administrative Code.

If you have any questions, please contact Michael DuBose, Historic Preservationist, by email at <u>Michael.DuBose@dos.myflorida.com</u> or telephone at 850.245.6342.

Sincerely,

Killy L Chase

Alissa Lotane Director, Division of Historical Resources & State Historic Preservation Officer

TECHNICAL REPORT

CULTURAL RESOURCES ASSESSMENT SURVEY FOR THE ROBERTS ROAD NORTH EXPANSION AREA AND NASA PARKWAY CONNECTOR AT KENNEDY SPACE CENTER BREVARD COUNTY, FLORIDA

AUGUST 2022







TECHNICAL REPORT

BREVARD COUNTY, FLORIDA

CONTRACT NUMBER: 1884085 SEARCH PROJECT NUMBER: R21181

PREPARED FOR:

Space Exploration Technologies 1 Rocket Road Hawthorne, California 90250

PREPARED BY:

SEARCH, INC. 3117 EDGEWATER DRIVE ORLANDO, FLORIDA 32804

AUTHORED BY: MIKEL TRAVISANO, MS JASON NEWTON, MA, MLIS WILLIAM WERNER, MA

William Wern

WILLIAM WERNER, MA PROJECT MANAGER

AUGUST 2022

EXECUTIVE SUMMARY

SEARCH conducted a Phase I cultural resources assessment survey (CRAS) for Space Exploration Technologies (SpaceX) improvements and operations at the National Aeronautics and Space Administration (NASA) John F. Kennedy Space Center (KSC) in Brevard County, Florida. The proposed improvements include the expansion of the SpaceX operations area along Roberts Road and the construction of a new road between Roberts Road and NASA Parkway. The goal of the investigation is to identify cultural resources listed or eligible for listing in the National Register of Historic Places (NRHP) that may be affected by the proposed project.

The Roberts Road north expansion area is approximately 41 ha (102 ac), and the NASA Parkway connector encompasses approximately 32 ha (80 ac). The boundaries of these two areas constitute the archaeological area of potential effects (APE). Based on the height of the proposed structures, a separate architectural APE was defined to extend 1.6 km (1.0 mi) from the Roberts Road north expansion area plus the footprint of the NASA Parkway Connector.

Fieldwork was conducted in October 2021 and May 2022. The Roberts Road north expansion and NASA Parkway connector areas consist predominantly of freshwater wetlands that were inundated during both field visits. One shovel test was excavated within the Roberts Road north expansion area, and the remainder of the project area was visually inspected from accessible points. No evidence of archaeological resources was found within the shovel test or during visual inspection.

The architectural survey resulted in the identification and evaluation of four resources within the architectural APE, including two previously recorded resources and two newly recorded resources. The two previously recorded resources include the NASA Railroad at KSC (8BR02931) and the NRHP-eligible SRB ARF Manufacturing Building #L6-0247 (8BR01998). It is SEARCH's opinion that the proposed project poses no adverse effect to the NRHP-eligible Resource 8BR01998. The NASA Railroad at KSC (8BR02931) is not individually eligible for listing in the NRHP, though it is eligible where it contributes to the associated NASA KSC Railroad System Historic District (8BR02932). SEARCH found that the NRHP-eligible historic district (8BR02932) was incorrectly mapped within the APE in the Florida Master Site File database. As originally documented, the eligible historic district does not extend south of Schwartz Road outside of the APE. The portion of the railroad (8BR02931) within the APE therefore does not contribute to the eligibility of the district (8BR02932).

The newly recorded resources include one bridge (8BR04443) and one tower structure (8BR04444). Resources 8BR04443 and 8BR04444 are recommended ineligible for listing in the NRHP. In summary, SEARCH recommends a finding of no adverse effects to historic properties as a result of the project. No further cultural resource work is recommended.

TABLE OF CONTENTS

Executive Summary	i
List of Figures	v
List of Tables	vii
Introduction	1
Environmental Setting	5
Paleoenvironment	9
Cultural Context	. 11
Native American Culture History	. 11
Paleoindian Period (12,000–10,000 BP)	. 11
Archaic Period (10,000–2500 BP)	. 11
Post-Archaic Period (2500–500 BP)	. 12
History of Brevard County	. 13
European Exploration and Early Settlement, 1513–1821	. 13
American Territorial Period through the Civil War, 1812–1861	. 14
Late Nineteenth Century, 1861–1899	. 15
Twentieth Century to Present, 1900–Present	. 15
Background Research	. 19
Florida Master Site File Review	. 19
Historic Maps and Aerial Photographs	. 21
Research Design and Methods	. 27
Archaeological Probability	. 27
Survey Methods	. 27
Archaeological Survey Methods	. 27
Architectural Survey Methods	. 28
Laboratory Methods and Curation	. 28
Survey Results	. 29
Archaeological Survey Results	. 29
Architectural Resources	. 32
Solid Rocket Booster Assembly and Refurbishment Facility Manufacturing Building #L6-	
0247 (8BR01998)	. 36
NASA Railroad at KSC (8BR02931) and NASA KSC Railroad System Historic District	
(8BR02932)	. 38
Roberts Road Footbridge (8BR04443)	. 40
Kennedy Space Center Communication Tower (8BR04444)	. 42
Conclusions and Recommendations	. 45
References Cited	. 47

Appendix A: FMSF Site Forms Appendix B: FDHR Survey Log Sheet

LIST OF FIGURES

Figure 1. Location map
Figure 2. Overview of the archaeological and architectural APE
Figure 3. Topographic map of the APE
Figure 4. DEM of the Roberts Road north expansion area7
Figure 5. DEM of the NASA Parkway connector
Figure 6. Previously recorded cultural resources and cultural resource surveys within the APE.20
Figure 7. GLO survey maps of Township 22 South, Ranges 36 and 37 East (GLO 1960a, 1860b).23
Figure 8. Orsino, FL USGS topographic map (USGS 1949)24
Figure 9. USDA aerial photograph of Brevard County, FL (USDA 1958)
Figure 10. Orsino, FL USGS topographic map (USGS 1976)
Figure 11. View northwest along east boundary of the Roberts Road north expansion area near
at the location of the shovel test
Figure 12. Shovel test location within the Roberts Road north expansion area
Figure 13. View north from the south boundary of the Roberts Road north expansion area,
toward area of higher ground, showing wetland vegetation
Figure 14. View west from trail within the NASA Parkway connector, showing inundated terrain
and wetland vegetation
Figure 15. Aerial imagery of resources within the architectural APE (1 of 3)
Figure 16. Aerial imagery of resources within the architectural APE (2 of 3)
Figure 17. Aerial imagery of resources within the architectural APE (3 of 3)
Figure 18. Representative views of Resource 8BR01998. Top: facing southeast; bottom: facing
northeast
Figure 19. Representative view of Resource 8BR02931, facing south (top and bottom)
Figure 20. Representative views of Resource 8BR04443. Facing northeast (top left); facing north
(top right); facing northwest (bottom left); facing northeast (bottom right) 42
Figure 21. Representative views of Resource 8BR04444. Top: facing south; bottom: facing
southeast

LIST OF TABLES

Table 1. USDA Soil Map Units and Drainage Classifications within the Archaeolog	gical APE 5
Table 2. Previous Cultural Resource Surveys within the APE.	
Table 3. Previously Recorded Cultural Resources within the APE	
Table 4. Resources Located within the Architectural APE	

INTRODUCTION

SEARCH conducted a Phase I cultural resources assessment survey (CRAS) for Space Exploration Technologies (SpaceX) improvements and operations at the National Aeronautics and Space Administration (NASA) John F. Kennedy Space Center (KSC) in Brevard County, Florida. The proposed improvements include the expansion of the SpaceX operations area along Roberts Road and the construction of a new road between Roberts Road and NASA Parkway (**Figure 1**). The goal of the investigation is to identify cultural resources listed or eligible for listing in the National Register of Historic Places (NRHP) that may be affected by the proposed project.

The Roberts Road north expansion area is approximately 41 ha (102 ac), and the NASA Parkway connector encompasses approximately 32 ha (80 ac). Both footprints are currently undeveloped and consist primarily of marshy terrain. The boundaries of these two areas constitute the archaeological area of potential effects (APE). Based on the height of the proposed structures, a separate architectural APE was defined to extend 1.6 km (1.0 mi) from the Roberts Road north expansion area plus the footprint of the NASA Parkway expansion area **(Figure 2)**.

The CRAS was performed in accordance with the Florida Division of Historical Resources (FDHR) *Cultural Resource Management Standards & Operations Manual, Module Three: Guidelines for Use by Historic Preservation Professionals*. The principal investigator for this project meets the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation (48 FR 44716-42). This study complies with Chapter 267 of Florida Statutes and Rule Chapter 1A-46, Florida Administrative Code, as well as Public Law 113-287 (Title 54 USC), which incorporates the provisions of the National Historic Preservation Act of 1966, as amended, and 36 CFR Part 800 (Protection of Historic Properties).



Figure 1. Location map.



Figure 2. Overview of the archaeological and architectural APE.

ENVIRONMENTAL SETTING

The project area is within the KSC on Merritt Island in northeastern Brevard County, Florida. The Roberts Road north expansion area is in Section 36 of Township 22 South, Range 36 East and is directly north of the existing SpaceX operations center. The NASA Parkway connector is to the southwest within Section 35 of Township 22 South, Range 36 East. Merritt Island consists of an accreted series of coastal ridges that formed during the Holocene era (Brooks 1981). The project area is on the western side of the peninsula and is characterized by swamps and low flatwoods with little relief and sluggish drainage. Land cover within the Roberts Road north expansion area includes hardwood hammock/wetland forest, oak palmetto-scrub, freshwater wetland scrub-shrub, and cabbage palm. The NASA Parkway connector includes freshwater marsh, freshwater wetland scrub-shrub, and hardwood hammock/wetland forest. These areas are dominated by thick understories of cordgrass, saw palmetto, wax myrtle, and invasive species such as Brazilian pepper with stands of oak and cabbage palm on areas of slightly higher elevation.

Soils within the Roberts Road north expansion area and NASA Parkway connector are exclusively poorly to very poorly drained based on data from the US Department of Agriculture (USDA) summarized in **Table 1**. The archaeological APE is represented on the US Geological Survey (USGS) topographic map as a low, partially inundated floodplain with less than 1.5 m (5.0 ft) elevation (**Figure 3**). Light detection and ranging (LiDAR) data provide a higher-resolution digital elevation model (DEM) showing that with the exception of the elevated roadways, the vast majority of the Roberts Road north expansion area and NASA Parkway connector are less than 1.0 m (3.2 ft) in elevation (**Figure 4** and **Figure 5**). Isolated areas of slightly higher elevation are present, particularly along the east boundary and throughout the west–central portion of the Roberts Road north expansion area, but these areas are amorphous with no evidence of a distinct landform.

NASA Parkway Connector					
Soil Map Unit	Drainage	Acreage	Percent		
Basinger sand	Poorly drained	1.25	1.56		
Chobee mucky loamy fine sand, depressional	Very poorly drained	0.07	0.09		
Riviera sand, 0 to 2 percent slopes	Poorly drained	4.97	6.21		
Riviera and Winder soils, depressional	Very poorly drained	47.87	59.84		
St. John's sand, 0 to 2 percent slopes	Poorly drained	10.04	12.55		
Turnbull and Riomar soils, tidal	Very poorly drained	0.33	0.41		
Wabasso sand, 0 to 2 percent slopes	Poorly drained	15.05	18.81		
Water		0.42	0.52		
Total		80.00	100.00		
Roberts Road North Expansion Area					
Soil Map Unit	Drainage	Acreage	Percent		
Basinger sand, depressional	Very poorly drained	8.55	8.45%		
Bradenton fine sand, limestone substratum	Poorly drained	56.77	56.11%		
Chobee mucky loamy fine sand, depressional	Very poorly drained	1.35	1.33%		
Copeland-Bradenton-Wabasso complex, limestone substratum	Poorly drained	31.33	30.96%		
Myakka sand, 0 to 2 percent slopes	Poorly drained	0.59	0.58%		
Wabasso sand, 0 to 2 percent slopes	Poorly drained	2.59	2.56%		
Total		101.18	100.00%		

Table 1. USDA Soil Map Units and Drainage Classifications within the Archaeological APE.



Figure 3. Topographic map of the APE.



Figure 4. DEM of the Roberts Road north expansion area.



Figure 5. DEM of the NASA Parkway connector.
PALEOENVIRONMENT

Between 18,000 and 12,000 years before present (BP), Florida was a much cooler and drier place than it is today. Melting of the continental ice sheets led to a major global rise in sea level (summarized for long time scales by Rohling et al. 1998) that started from a low stand of -120 m at 18,000 BP. The rise was slow while glacial conditions prevailed at high latitudes but became very rapid toward the end of the Pleistocene and the beginning of the Holocene. Conditions became rapidly warmer and wetter during the next three millennia. By about 9000 BP, a warmer and drier climate began to prevail. These changes were more drastic in northern Florida and southern Georgia than in southern Florida, where the "peninsular effect" and a more tropically influenced climate tempered the effects of the continental glaciers that were melting far to the north (Watts 1969, 1971, 1975, 1980). Sea levels, though higher, were still much lower than at present. Surface water was limited, and extensive grasslands probably existed that may have attracted mammoth, bison, and other large grazing mammals. By 6000–5000 BP, the climate had changed to one of increased precipitation and surface water flow. By the late Holocene, circa (ca.) 4000 BP, the climate, water levels, and plant communities of Florida attained essentially modern conditions. These have been relatively stable with only minor fluctuations during the past 4,000 years.

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CULTURAL CONTEXT

The following cultural context for eastern Florida consists of a Native American culture history and a historical summary of Brevard County. The pre-contact Native American culture history consists of a three-part chronology, with each period based on distinct cultural and technological characteristics recognized by archaeologists. The three temporal periods that predate the written record are Paleoindian, Archaic, and Post-Archaic; dates associated with these periods are presented in years BP. The historical summary of Brevard County reviews the early European exploration and settlement in the region beginning in the sixteenth century, the establishment of Brevard County in the nineteenth century, and the major events of the twentieth century, including the development of KSC.

NATIVE AMERICAN CULTURE HISTORY

Paleoindian Period (12,000–10,000 BP)

Current evidence indicates that the first inhabitants of Florida entered the area more than 10,000 years ago. During the Paleoindian period (12,000–10,000 BP), the sea level was much lower than today, and the Florida peninsula was wider and drier, particularly in the central interior. Many animal species that are now extinct roamed the state, including mammoths, camels, sloths, and giant land tortoise, and Florida's earliest inhabitants hunted these animals. Most of the known Paleoindian sites are located in north and west-central Florida, where karst springs and chert were readily available.

The conventional view of Paleoindian existence in Florida has been that they were nomadic hunters and gatherers within an environment quite different than that of the present. Excavations at the Harney Flats site in Hillsborough County (Daniel and Wisenbaker 1987) have altered this view, and many archaeologists now believe that Paleoindian people lived part of the year in habitation sites that were located near critical resources, such as fresh water.

Archaic Period (10,000–2500 BP)

During the subsequent Archaic period (10,000–2500 BP), human populations began to expand outward from north-central Florida as the climate became wetter and water sources more prevalent. After the demise of Pleistocene fauna, human subsistence strategies became more diverse and included new plant, animal, and aquatic species. People began to live in larger groups, use different types of stone tools, and inhabit more of what is now Florida.

The Early Archaic (10,000–7000 BP) represented a continuity of the Paleoindian occupation of Florida and occurred during a time of rising sea levels, a gradual warming trend, and the spread of oak hardwood forests and hammocks. Numerous small Early Archaic special activity and camp sites have been located throughout the East Central Florida region (Milanich 1994). The Middle Archaic (7000–5000 BP) was a wetter period with the intrusion of mixed pine and oak into the

hardwood forest. As conditions became wetter, large river systems and wetlands developed, and people began to exploit the resources associated with these aquatic habitats. This trend continued into the Late Archaic period (5000–2500 BP); however, there is evidence that suggests that the environment became slightly drier during this period, and aquatic habitats were fewer and not as deep (Russo 1986). Precontact populations in Brevard County were probably much smaller than more productive locales along the lower St. Johns River.

The earliest pottery was tempered with plant fibers and first appeared between about 4000 and 3000 BP (Sassaman 1993). The people who made fiber-tempered pottery practiced an essentially Archaic lifestyle of hunting, gathering, and incipient horticulture. One of the centers of early ceramic production was along the Atlantic Coast between southern South Carolina and northern Florida. Fiber-tempered pottery was made with naturally occurring clays that were collected from areas where creeks or rivers had cut down to the clay-bearing layers. Plant fibers were then added to the clay as a tempering agent to strengthen it. Traditionally, manufacture of this ware was believed to span approximately 1,500 years, with plain and decorated variants (e.g., incised, and punctated types) undergoing periods of stylistic popularity (Bullen 1972). More recent radiometric analysis, however, suggests that the production of fiber-tempered wares, at least in the Middle St. Johns River Valley, spanned a shorter interval from about 4100–3600 BP (Randall and Sassaman 2005) with stylistic variability attributable to ethnic, sociopolitical, and functional factors more so than to temporal trajectory (Sassaman 2003).

Post-Archaic Period (2500–500 BP)

The Post-Archaic Native American traditions in the project region are often classified under the term Malabar. The Malabar period is divided into two sub periods. Malabar I (2500–1200 BP) is recognized archaeologically by the dominance of sand-tempered pottery in assemblages, while Malabar II (1200–500 BP) is identified by the presence of St. Johns Check Stamped. During Malabar I, wetter conditions prevailed, aquatic habitats became more numerous, and freshwater fish more abundant. This enabled larger populations to live year-round in the upper St. Johns region. This trend continued into Malabar II. In addition to terrestrial habitats, Malabar people also exploited the coast. What is unclear, however, is whether the same populations moved back and forth between the coast and the interior, or whether separate populations inhabited these two areas.

At the beginning in the early sixteenth century, Florida's native peoples were invaded by Spanish explorers claiming the New World for their king. Although this part of Florida was not a major focus of the colonization initiative, the native peoples came in contact with the Spanish and their goods (Milanich 1995:65-68). Archaeological sites from this period are located along the coast and in the marshy headwaters of the St. Johns River. Shell middens and burial mounds are common, and subsistence remains indicate that the peoples were primarily hunters, fishers, and gatherers without agriculture.

HISTORY OF BREVARD COUNTY

European Exploration and Early Settlement, 1513–1821

The area that is now Brevard County served as an important stage for many early European expeditions in North America. Some historians believe that the Italian captain John Cabot sailed south along the Brevard coast during his 1498 explorations (Dovell 1952; Eriksen 1994). There is also evidence that Spanish ships raided indigenous coastal villages to capture and enslave people. When Juan Ponce de León came to Florida, he found a local who understood Spanish. Ponce de León left Puerto Rico on March 3, 1513, with three ships. After sailing on a northwesterly course for 30 days, the ships landed either north of Cape Canaveral (Milanich 1995) or in the vicinity of modern-day Melbourne Beach (Eriksen 1994; Gannon 1996). Ponce de León sighted land during the Feast of Flowers (Pascua Florida) and called it La Florida (Milanich 1995). Ponce de León remained at this initial landing place for six days before pulling anchor and sailing toward Jupiter Inlet, where he landed to restock firewood and water for the ships. The fleet rode the countercurrents of the Gulf Stream to Biscayne Bay and eventually rounded the southern tip of the peninsula (Gannon 1996; Milanich 1995). The island off the Brevard coast became known as Canaveral, the Spanish term for canebrake. Many maps depict Cape Canaveral beginning in the sixteenth century maps and it is one of the oldest place names in North America (Eriksen 1994).

The Gulf Stream located off the Brevard coast emerged an important thoroughfare for the transportation of New World supplies to Europe. The Spanish treasure galleons rode this warm current from Havana through the Bahama Channel. Wrecks occurred regularly in the treacherous shoals around Cape Canaveral, and the local Indian tribe, the Ais, often recover the cargo. The Spanish crown realized the importance of this trade route, and when they heard that the French eastblished a colony, Fort Caroline, on the St. Johns River near modern-day Jacksonville, they decided to act. The Spanish Crown tasked Pedro Menéndez de Avilés, a highly respected officer in the Spanish navy, with eradicating the French influence in the area and starting a colony in La Florida (Milanich 1995). The French colony awaited supplies and reinforcements coming from France under the command of Jean Ribault. Menéndez felt it crucial to reach and destroy Fort Caroline before Ribault arrived. In August 1565, Menéndez, with his fleet of 10 ships, sighted Cape Canaveral (Gannon 1996; Milanich 1995). The Spanish force searched for six weeks along the northern Florida coast before they found the French fort. A tropical storm had scattered the French defenses and left the fort an easy target for Menéndez to destroy. During the gale, a ship of French colonists had wrecked somewhere near Cape Canaveral. While Menéndez marched south along the coast to meet the wayward French force, he kept a detailed description of the area, including Brevard County. The Spanish constructed the garrison Santa Lucia on the high plateau near Jupiter Inlet as a line of defense for the new colony (Eriksen 1994; Milanich 1995).

In 1605, the Spanish sent a delegation under the command of Álvaro Mexía to the Brevard area. Spanish officials charged the diplomat with placating the Ais and mapping the region. His mission proved successful. Mexía became an honorary chief of the tribe, and explored the Indian and Banana Rivers (which the Spanish called Rio de Ais and Ulumay Lagoon). Mexía's maps detail many Indian settlements along the shores of Mosquito Lagoon (at the north end of the Indian River). It is possible that his entourage spread orange seeds along the banks of the Indian River (Eriksen 1994).

On July 24, 1715, a flotilla of 11 Spanish ships carrying 14 million pesos in gold, silver, and jewels left Havana for Europe. A few days into the voyage, 10 of the 11 ships wrecked off the East Florida coast between St. Lucie and Mantanzas. Approximately 700 sailors died, and an additional 1,500 washed up on the coast. The Ais aided the Spaniards by providing them with supplies and instructions for gathering food in the dunes. The Spanish government, desperate to recover the lost treasure, established an encampment of salvers in the vicinity of the present-day Sebastian State Park in the far southern portion of Brevard County. Salvers recovered only one-third of the lost cargo (Eriksen 1994).

In the mid-1700s, European colonial powers fought a worldwide war, the Seven Years War, as a means to consolidate their colonial holdings. After the British victory in the Seven Years War in 1763, they traded their Havana conquest to Spain for Florida. The British divided the colony along the Apalachicola River into East and West Florida. In 1765, the botanist John Bartram and his son William searched for the St. Johns River headwaters (Eriksen 1994; Tebeau 1980 [1971]). The two became the first Europeans to document the Brevard region (Eriksen 1994). In 1783, the Treaty of Paris restored Florida to Spain, whose control of the territory remained tenuous (Tebeau 1971). Vicente Manuel de Zéspedes, the Spanish governor, wrote to the king in 1785 that isolated groups of Americans had settled in the area (Eriksen 1994; Tebeau 1980 [1971]). Immigrants from the indigenous tribes north of Florida now numbered 5,000 to 6,000 in the colony. The majority of these "Seminoles" remained west of the St. Johns River. The area known as the Mosquito Coast included present-day Brevard County (Eriksen 1994).

The American colonies declared their independence from British rule in 1776. The last naval battle of the American Revolutionary War took place off the coast of Cape Canaveral on March 10, 1783, when the British HMS Sybil gave chase to two Continental Navy Ships who carried silver from Cuba to support the Continental Army. The battle resulted in a victory for the American side with the HMS Sybil badly damaged and fleeing from the fight (Florida Division of Historical Resources 2006). In 1783, the Treaty of Paris ended the American Revolution and returned Florida to Spain.

American Territorial Period through the Civil War, 1812–1861

Florida became a territorial possession of the United States after President James Monroe ratified the Adams-Onís Treaty on February 22, 1821. The United State Government appointed General Andrew Jackson governor of the territory later that same year (Eriksen 1994; Tebeau 1980 [1971]). Jackson partitioned Florida into two counties, Escambia to the west and St. Johns to the east. In 1824, the area encompassing most of east-central Florida, including Brevard County, officially became Mosquito County.

On Christmas Day 1835, the Second Seminole War brought conflict to East Florida when Indian forces razed portions of present-day Brevard County. Along with a severe freeze in 1835, the war decimated Mosquito County's population, as most everyone fled to safe havens outside the

county (Shofner 1995:36). The war ended in 1842, and on March 14, 1844, the territorial government created St. Lucie County (present-day Brevard County), from Mosquito County (Carter 1962:994-995; Dunn 1998:34).

On March 3, 1845, Florida became the twenty-seventh state admitted to the Union (Eriksen 1994). Judge Theodore Washington Brevard settled in Tallahassee two years later. He spent 12 years as state comptroller and became the namesake for Brevard County on January 6, 1855. This new county encompassed more than 7,000 square miles and had its seat of government in the small town of Susannah, north of Fort Pierce (Eriksen 1994; Fernald and Purdum 1992; Morris 1995). John Houston established Arlington, the first permanent US settlement in south Brevard County, in 1854 (Eriksen 1994).

On January 10, 1861, Florida seceded from the Union. Brevard County remained far removed from the battlefields to the north, but still played an important role in the war. The settlers along the Indian River engaged in salt production for the Confederate Army. Blockade runners frequently utilized the inlets and bays of the Indian River and Mosquito Lagoon during their smuggling ventures (Tebeau 1980 [1971]).

Late Nineteenth Century, 1861–1899

Prior to the 1880s, water transportation, both sea and river, emerged as the dominant mode of long-distance travel for most of Florida's residents. Due to Florida's dearth of population, underdevelopment, and lack of capital, railroads penetrated into the state slowly. By the mid-1800s, Florida claimed only one successful rail line, and it connected Tallahassee to the Gulf of Mexico at St. Marks (Brown 1991:13-14). Most of Florida's roads remained slow, bumpy, and waterlogged (during summer months), sand-laden trails that even ox teams had a difficult time traversing. With the arrival of Henry Flagler and Henry Plant in the 1880s, trains began to cross the Florida landscape. Railroads generally brought growth to the communities and regions they touched (Covington 1957:136, 169; Johnson 1966:129).

Citizens elected Titusville as the permanent seat of government for Brevard County in 1879. The population of the Indian River area rapidly expanded due to a solid economic base of agriculture and recreational fishing. Titusville became a stop on the Jacksonville, Tampa, and Key West Railway in 1885. In 1890, a group of wealthy Harvard graduates founded the 18,000-acre Canaveral Club, which is now the Merritt Island National Wildlife Refuge. In 1893, the Florida East Coast (FEC) Railway line came to Titusville and Eau Gallie (Eriksen 1994).

Twentieth Century to Present, 1900–Present

Not until the end of the nineteenth century did Florida realize any concerted effort in road development. With the proliferation of railroads, farmers, merchants, and others clamored for better roads to get goods and people to and from the railroad depots. Additionally, during the 1910s and 1920s, the number of automobiles in the state and nation increased exponentially, exerting more pressure on the government to develop roads. Prior to 1924, only 748 miles of hard-surfaced road existed in the state. By 1928, this number grew to 1,588 miles with an

additional 59 miles in the process of being paved (Jackson 1992; Kendrick 1964; Tebeau 1980 [1971]). Not surprisingly, as car ownership increased and roads improved, train dominance diminished.

In 1917, Brevard County achieved its modern-day dimensions when the southern portions of the county became St. Lucie and Okeechobee Counties, and the western portion became Osceola County (Fernald and Purdum 1992). The center of population in the county shifted from Titusville in the north to Eau Gallie, Cocoa, and Melbourne in the south. A bridge constructed from Cocoa to Merritt Island opened a link to the many small communities on the coast. By the mid-1920s, four bridges spanned the river and new towns sprouted up along the beaches as a result of these bridges (Eriksen 1994).

Cape Canaveral and the islands off the coast had been primarily isolated until the construction of bridges connecting them to the mainland (Lethbridge 2021). However, even after the construction of bridges, they remained sparsely settled for several more decades (Hiller 2005). By 1936, only two settlements remained evident near Cape Canaveral, Canaveral and Artesia (Florida State Road Department 1936). At the dawn of World War II, roughly 100 people called Cape Canaveral home (Lethbridge 2021). As war approached in 1939, the military chose land south of Cocoa Beach to build the Banana River Naval Air Station (Eriksen 1994). At war's end, the US government deactivated the Banana River Naval Air Station (Morris 1948; Stone 1988). In 1949, President Harry S. Truman established the Joint Long Range Proving Ground at Cape Canaveral. Banana River Naval Air Station became Patrick Air Force Base in 1950 and hosted experimental launches of hybrid rockets as a supporting base for Cape Canaveral (Archaeological Consultants, Inc. [ACI] 2010). Following the launch of Soviet satellites into orbit in 1957, American interests turned to exploration of space. Originally the new mission belonged to the Department of Defense, but in 1958, President Dwight D. Eisenhower formed the National Aeronautics and Space Administration (NASA).

Settlement in present-day Cape Canaveral boomed with the arrival of the space program. NASA began operations on the Cape in 1958 when the Army Missile Firing Laboratory, transferred to NASA. Initially, the agency used several Cape Canaveral Air Force Station facilities including offices, hangars, and several launch complexes. The US Army Corps of Engineers acted as purchasing agent for NASA, to slowly gain the title to over 83,903.9 acres on Merritt Island. This new stretch of land included the small towns of Orsino, Wilson, Health, and Audubon, as well as orchards, crop land, and several small fishing villages. The State of Florida provided submerged land and much of the land south of the old Haulover Canal and north of the barge canal. Improvements to the area began which included the widening of several roads, such as sections of the A1A (Hiller 2005). As plans and building progressed, NASA and the US Fish and Wildlife Service reached an interagency agreement on August 28, 1963, the US fish and Wildlife Service 2015).

The original plan for the new space center included a railroad system within the new facility named John F. Kennedy Space Center in 1963 following the assassination of President John F.

Kennedy. The FEC agreed to build and operate a railroad for the NASA in 1962. The US Army Corps of Engineers, Jacksonville District and Maurice H. Connell & Associates of Miami, Florida laid the original lengths of railroad track for the KSC between 1963 and 1965. The FEC took responsibility for the construction of several shorter segments of the railroad which connected the new system to their existing tracks. Construction used salvaged material from the double line track that the FEC had removed in 1961. The agreement included the construction of the Jay Jay Bridge, which crossed the Indian River connecting two small dredge-created peninsulas (ACI 2013).

Construction proceeded and erected a complex of more than 50 buildings on the island, including one of the largest buildings in the world, the Vehicle Assembly Building. On July 16, 1969, the first manned mission to the moon left KSC. Lifting off at exactly 9:32am from Launch Pad 39A, the crew of the Apollo 11 left Earth and made the first lunar landing the next day (Uri 2019). The railroad remained unchanged until 1974, when a spur connected the west branch of tracks to the shuttle landing facility. Railroad cars hauled an estimated 500,000 barrels of cement for construction of the landing strip (ACI 2013). The railroad also proved crucial to movement of solid rocket motor segments, because of their size and hazardous nature. By the early 1980s, railroad operations had increased to the point that daily round trips became necessary to pick up and deliver cars to and from FEC's mainline connection.

When NASA decided to move the solid rocket booster operations from the Vehicle Assembly Building, new railroad tracks proved necessary to deliver the solid rocket motor segments to the new Rotating, Processing and Surge Facility complex. During that time, NASA purchased the FEC operated spur west of Wilson's corner and took over operations of several railroad tracks and the Jay Jay bridge. Repairs completed included the replacement of bolted track with nearly 1,000 feet of welded rail and the replacement of over 35,000 wooden crossties with concrete ones (*Florida Today* 24 Aug 2001; National Park Service 1983). As the NASA mission changed, the facilities adapted to meet its needs. The space industry had a dramatic effect on the area. Brevard County grew by 371% from 1950 to 1960 and the population doubled again during the 1960's (Tebeau 1980 [1971]). This growth continued to nearly 400,000 residents in 1990 (US Census Bureau 1995).

In recent years, the KSC and Cape Canaveral Air Force Station have been referred to under one name: the Cape Canaveral Spaceport, showing the growing partnership KSC and the 45th Space Wing. Together they represent the future of Florida's Space Coast (NASA 2017). In addition, the KSC has begun a new era of space exploration with the closure of the Space Shuttle program and the conversion of facilities to commercial launch sites that could host multiple types of spacecraft. In 2010, four years of upgrades finished at the KSC Launch Equipment Test Facility. Since the Space Shuttle Program reached its end in 2011, most launches from KSC have been unmanned flights, but they have continued to attract tourists (Beutel 2010). Brevard County continued to benefit from its location along the Space Coast, and its population reached over 500,000 by 2010 (US Census Bureau 2010). Starting in 2014, NASA sought to establish partnerships with private companies, through their "Tipping Point" Awards and Commercial Crew Program (Sheetz 2019). Private companies have since assumed responsibility for many of the

functions NASA performed in the past. In December 2019, the Department of Defense created a new branch of the military, the United State Space Force. That same month, the US government redesignated Cape Canaveral Air Force Station and Patrick Air Force Base as Space Force installations, and the latter became Cape Canaveral Space Force Station (Wallace 2021).

BACKGROUND RESEARCH

FLORIDA MASTER SITE FILE REVIEW

The Florida Master Site File (FMSF) database (updated April 2022) was reviewed to identify previously conducted cultural resource surveys or previously recorded cultural resources within the APE. The FMSF review indicates that seven previous cultural resource surveys intersect the APE (**Table 2; Figure 6**). Four of the previous surveys (FMSF Survey Nos. 2992, 3447, 19482, and 26810) within the APE targeted zones of high archaeological potential or specific parcels. The remaining three surveys (FMSF Survey Nos. 260, 20744, and 20760) consisted of large-scale cultural resource and architectural surveys to document cultural resources at the KSC or the Merritt Island National Wildlife Refuge.

FMSF Survey Nos. 3447, 19482, and 26810 are the most relevant of these to the current survey. FMSF Survey No. 3447 was conducted in 1991 by ACI and included reconnaissance survey and systematic shovel testing in zones of high archaeological probability along Kennedy Parkway North. None of the archaeological sites documented on this survey are located within the current APE (ACI 1991). FMSF Survey No. 19482 was conducted in 2012 by ACI and included historical and architectural survey of the Jay Jay Railroad Draw Bridge, KSC Railroad System, and locomotives located at the KSC (Deming et al. 2012). FMSF Survey No. 26810 was conducted in 2019 by ACI for the Discovery Solar Energy Center Property, encompassing 206 ha (508 ac) immediately southwest of the Roberts Road north expansion area. The survey included the excavation of 153 shovel tests and an architectural history survey. No cultural resources were documented as a result of this survey (ACI 2019).

Survey No.	Title	Date	Consultant
260	Cultural Resource Reconnaissance of Merritt Island National Wildlife Refuae	1978	Cultural Resource Management. Inc.
2992	Archaeological Survey for Established Zones of Archaeological Potential (ZAPs) in the Launch Complex Area (Option 1), of the Kennedy Space Center	1991	ACI
3447	Archaeological Survey to Establish Zones of Archaeological Potential (ZAPS) in the Shuttle Landing and KSC South Area (Option 2) of the Kennedy Space Center	1991	ACI
19482	Historical Survey and Evaluation of the Jay Jay Bridge, Railroad System, and Locomotives, John F. Kennedy Space Center, Brevard County, Florida	2012	ACI
20744	Architectural Survey and Evaluation of 45 Facilities that have reached the age of 45-50 years, John F. Kennedy Space Center, Brevard County, Florida	2013	New South Associates, Inc.
20760	Architectural Survey and Evaluation of NASA- owned Facilities at Cape Canaveral Air Force Station	2013	New South Associates, Inc.
26810	Cultural Resource Assessment Survey of the Discovery Solar Energy Center Property, Brevard County, Florida	2019	ACI

Table 2. Previous Cultural Resource Surveys within the APE.



Figure 6. Previously recorded cultural resources and cultural resource surveys within the APE.

Further review of the FMSF database indicates that there are two previously recorded cultural resources within the APE (**Table 3**; see **Figure 6**). Resource 8BR01998 is the Solid Rocket Booster (SRB) Assembly and Refurbishment Facility (ARF) building, which has been evaluated as eligible for listing in the NRHP under Criterion A for historical associations with space exploration. Consideration G also applies to 8BR01998 because it achieved significance in less than 50 years. The SRB ARF served an essential role in the Space Shuttle program as a manufacturing and assembly building for non-propellant components such as the forward and aft skirts, frustums, and nose caps (Deming and Slovinac 2007).

Table 5. Freviously necorded Cultural Nesources within the AFE.							
FMSF No.	Name	Year Built	SHPO Evaluation				
8BR01998	SRB ARF Manufacturing Building #L6-0247	1986	Eligible for NRHP				
8BR02931	NASA Railroad at KSC	ca. 1963	Eligible for the NRHP as part of a historic district (8BR02932)*				

Table 3. Previously Recorded Cultural Resources within the APE.

*The portion of 8BR02931 within APE is not within historic district 8BR02932 and therefore does not contribute to its eligibility.

The NASA Railroad at KSC (8BR02931) has transported missile deliveries for Navy Trident and rocket deliveries for Air Force Titan. Additionally, it has been used to transport fuel and oxidizer shipments to Cape Canaveral Air Force Station (CCAFS) and functioned as support for the U.S. Manned Space Programs. The west branch, a roughly 30.0 km (18.6 mi) portion of the track, supported the delivery of solid rocket motor (SRM) segments and is considered to be the most historically significant portion of the resource (Deming et al. 2012). The west branch contributes to the NRHP-eligible NASA KSC Railroad System Historic District (8BR02932). The FMSF GIS database erroneously shows 8BR02932 to be colocated with 8BR02931 within the APE; however, review of the original documentation that recorded the district indicates that it does not extend into the current APE (Deming et al. 2012). The NASA Railroad at KSC (8BR02931) is otherwise not individually eligible for listing in the NRHP.

HISTORIC MAPS AND AERIAL PHOTOGRAPHS

Historic maps and aerial photographs were examined in order to identify past land use in the APE. The earliest detailed maps consulted were General Land Office (GLO) survey maps. The GLO maps were created by government land surveyors during the nineteenth century as part of the surveying, platting, and sale of public lands. In Florida, these maps characteristically show landscape features such as vegetation, bodies of water, roads, and Spanish land grants. The level of detail in GLO maps varies, with some also depicting structures, Native American villages, railroads, and agricultural fields. A GLO map of Florida Township 22 South, Ranges 36 and 37 East created in 1860 shows the land within the Project Area is plotted for sale but unclaimed. All other features are naturally occurring (**Figure 7**) (GLO 1860a, 1860b).

Late nineteenth century maps Merritt Island and Cape Canaveral are labeled, but no development was apparent near the APE (Martenet 1873). By 1890, the settlement of Courteney is the only settlement on Merritt Island southwest of the APE. Outside the APE to the west, the

Jacksonville, Tampa and Key West Railroad reached Titusville on the mainland of Brevard County (Norton 1890). By 1900, the railroad is owned by Florida East Coast Railroad and connected the eastern coast of Brevard County. No improvements are illustrated near the APE (Mast, Crowell & Kirkpatrick 1900). In 1910, no settlements are indicated on Merritt Island (C.S. Hammond & Company 1910). A general highway map of Brevard County from 1935 shows the town of Orsino outside the APE and connected by an improved road running generally north-south and labeled SR 219. SR 119 connected Merritt Island to the mainland of Brevard County. No other improvements are evident within the APE (Florida State Road Department 1935).

A topographic map created in 1949 shows a north-south road through the APE and adjacent to the eastern border of the Roberts Road north expansion area (**Figure 8**). Several areas within the APE are planted with citrus groves, and six buildings are evident along a road on the present daypath of Roberts Road. A north-south unimproved road intersects Roberts Road, and a northeastsoutheast road labeled SR A1A follows the present-day path of Kennedy Parkway. A road on the present-day alignment of NASA Parkway crossed the southern border of the APE (USGS 1949).

Aerial photography from 1958 shows several new fields improved as orchards and connected by unimproved roads within the APE (**Figure 9**; USDA 1958). A 1976 topographic map depicts a similar setting (**Figure 10**). Kennedy Parkway is a divided highway and officially labeled. A transmission line is west of the parkway on a similar path. The US government railroad is east of Kennedy Parkway within the APE (USGS 1976). The above features are limited to the architectural APE; no features are evident within the archaeological APE on the historical maps and aerial photographs that were inspected.



Figure 7. GLO survey maps of Township 22 South, Ranges 36 and 37 East (GLO 1960a, 1860b).



Figure 8. Orsino, FL USGS topographic map (USGS 1949).



Figure 9. USDA aerial photograph of Brevard County, FL (USDA 1958).



Figure 10. Orsino, FL USGS topographic map (USGS 1976).

RESEARCH DESIGN AND METHODS

The goal of the CRAS was to identify and record cultural resources (archaeological sites, cemeteries, or historic-age structures, bridges, linear resources, landscapes, or districts) that may be affected by the proposed project. The research was designed to be in accordance with the FDHR's Cultural Resource Management Standards & Operations Manual, Module Three: Guidelines for Use by Historic Preservation Professionals. The research design included background investigation, a historical document search, and a field survey. The background investigation involved a review of relevant archaeological and historical literature, environmental data, and previous cultural resource surveys conducted near the project area. The FMSF database was queried for previously recorded sites within the project area. Historic maps and early aerial photographs also were examined for information pertaining to the existence of historic-age structures or other indications of cultural activity. Current soil surveys and relevant literature were consulted to provide a description of the physiographic and geological region of which the project area is a part and to develop expectations regarding the types of archaeological sites that may be present. This information was used to determine zones of archaeological probability within the project area to guide the fieldwork sampling strategy. The research design and methods followed established state and federal guidelines.

ARCHAEOLOGICAL PROBABILITY

The probability of encountering archaeological sites within a project area is typically based on environmental factors such as relative elevation, soil drainage, and proximity to sources of fresh water. As discussed above, the archaeological APE consists of a combination of artificially elevated roadways and undeveloped, poorly to very poorly drained marshes and floodplains. These environments are considered to have low archaeological probability; however, LiDAR data presented above identified the highest landforms within these areas, which were targeted during the field survey to identify settings conducive to the presence of archaeological sites.

SURVEY METHODS

Archaeological Survey Methods

Visual inspection was conducted of all accessible portions of the archaeological APE to identify natural ground surfaces suitable for subsurface testing. One shovel test measuring 50 cm in diameter was excavated to bedrock. The shovel test profile was photographed, and notes were recorded on field forms.

Representative settings within the archaeological APE were photographed, and the location of each photograph and shovel test was recorded with a handheld Global Positioning System device and marked on a large-scale aerial photograph.

Architectural Survey Methods

The architectural survey for the project utilized standard procedures for the location, investigation, and recording of historic-age resources. In addition to a search of the FMSF database for previously recorded resources within the architectural APE, SEARCH reviewed USGS quadrangle maps for structures constructed prior to 1973. The field survey inventoried existing buildings, structures, and other aspects of the built environment within the APE. Each resource was plotted on USGS quadrangle maps and on project aerials. Resources were photographed with a digital camera, and all pertinent information regarding the architectural style, distinguishing characteristics, and condition was recorded. Upon completion of fieldwork, forms and photographs were returned to the SEARCH offices for analysis. Date of construction, design, architectural features, condition, and integrity of the structure, as well as how the resources relate to the surrounding landscape, were carefully considered. The resources were evaluated regarding their eligibility for listing in the NRHP.

Laboratory Methods and Curation

No artifacts were observed or collected during the survey. Photographs, GIS data, and associated field records are kept on file at the SEARCH office in Gainesville, Florida.

SURVEY RESULTS

ARCHAEOLOGICAL SURVEY RESULTS

The primary goal of the archaeological survey was to verify whether the Roberts Road north expansion area or the NASA Parkway connector footprints include landforms that could contain archaeological sites. As previously discussed, the archaeological APE is characterized by low relief and poor to very poor soils drainage, and LiDAR imagery indicates few areas of higher elevation. Visual inspection confirmed that the existing roads within the archaeological APE are constructed along built-up embankments. Accessible terrain beyond the roadways is characterized by near-total inundation and thick, hydric vegetation.

One dry area of possible natural ground surface was identified along the east boundary of the Roberts Road north expansion area, which also corresponds to the area of highest elevation within the APE on the previously discussed LiDAR imagery (**Figure 11**). A shovel test excavated at this location revealed a top layer of dark gray sand (0 to 25 cm) underlain by dark grayish brown wet sand until limestone bedrock was encountered at approximately 70 cm. No artifacts were identified in the shovel test or on the ground surface. Portions of the Roberts Road north expansion area inspected from the southeast corner and along the south boundary were found to be consistently underwater (**Figure 12** and **Figure 13**), and no elevated areas on the interior of

the parcel were visible. It is possible that there are upland areas within the Roberts Road north expansion area that could not be accessed by the archaeologists; however, based on the LiDAR data (see **Figure 4**), these would be represented by small, intermittent hammocks that are too small to sustain significant archaeological sites.

Similarly, the area within the NASA Parkway connector, when inspected from the existing trail, was found to be predominantly marsh (**Figure 14**). Based on this information, it is the opinion of SEARCH that the archaeological APE does not have the potential to contain significant archaeological sites.



Figure 11. View northwest along east boundary of the Roberts Road north expansion area near at the location of the shovel test.



Figure 12. Shovel test location within the Roberts Road north expansion area.



Figure 13. View north from the south boundary of the Roberts Road north expansion area, toward area of higher ground, showing wetland vegetation.



Figure 14. View west from trail within the NASA Parkway connector, showing inundated terrain and wetland vegetation.

ARCHITECTURAL RESOURCES

The architectural survey resulted in the identification and evaluation of four resources within the architectural APE, including two previously recorded resources and two newly recorded resources (**Table 4**; **Figures 15–17**). The previously recorded resources include the NASA Railroad at KSC (8BR02931) and one NRHP-eligible building (8BR01998). The newly recorded resources include one bridge (8BR04443) and one structure (8BR04444). The resources identified within the APE are described and evaluated below. As previously noted, the FMSF GIS database erroneously shows the NRHP-eligible NASA KSC Railroad System Historic District (8BR02932) within the APE. This resource has been updated to correct the mapping area and is discussed with 8BR02931 below. FMSF forms were completed for the resources and are provided in **Appendix A**. The survey log sheet is included in **Appendix B**.

Resource	Name/Address	Architectural Style	Year Built	Recommended NRHP Status
8BR01998	SRB ARF Manufacturing Building #L6-0247	Industrial Vernacular	1986	Eligible
8BR02931	NASA Railroad at KSC	No Style	ca. 1963	Ineligible within the APE
8BR04443	Roberts Road Footbridge	No Style	Before 1943	Ineligible
8BR04444	Kennedy Space Center Communication Tower	No Style	ca. 1965	Ineligible

Table 4. Resources Located within the Architectural APE.

The previously recorded resources within the APE include a segment of the NASA Railroad at KSC (8BR02931) and the SRB ARF Manufacturing Building #L6-0247 (8BR01998). The NASA Railroad at KSC (8BR02931) is not individually eligible for listing in the NRHP, and the portion within the APE is not part of its associated NRHP-eligible historic district (8BR02932). The proposed project poses no adverse effect to the previously recorded NRHP-eligible Resource 8BR01998.

The newly recorded resources include Roberts Road Footbridge (8BR04443), a small footbridge crossing the ditch on the north side of Roberts Road, and one communication tower (8BR04444) on the south side of Schwartz Road. Based on the results of the current survey, it is the opinion of SEARCH that the newly recorded Resources 8BR04443 and 8BR04444 are not eligible for listing in the NRHP.



Figure 15. Aerial imagery of resources within the architectural APE (1 of 3).



Figure 16. Aerial imagery of resources within the architectural APE (2 of 3).



Figure 17. Aerial imagery of resources within the architectural APE (3 of 3).

Solid Rocket Booster Assembly and Refurbishment Facility Manufacturing Building #L6-0247 (8BR01998)

The SRB ARF Manufacturing Building #L6-0247 is a previously recorded NRHP-eligible historic building within the architectural APE. Resource 8BR01998 was recommended eligible for listing in the NRHP. and the SHPO concurred with this recommendation on May 27, 2008, for its historic significance relating to transportation/aerospace under NRHP Criteria A and Criteria Consideration G, as it achieved historic significance in less than 50 years (Deming and Slovinac 2007). The SRB ARF Manufacturing Building is in Section 19 of Township 22 South, Range 37 East as shown on the 2021 *Orsino, Fla*. USGS quadrangle map. A representative view of Resource 8BR01998 is included in **Figure 18**.

Resource 8BR01998 is an Industrial Vernacular building that comprises part of the Booster Fabrication Facility. The building is comprised of a central high bay with three-story wings to the north and south. It is partially constructed of hollow concrete block, insulation-filled concrete block, reinforced poured concrete, with a steel skeleton (Deming and Slovinac 2007). The building has a poured concrete floor and a flat, built-up roof. Concrete block and metal panels cover the exterior. The main entrance is on the north elevation and features a pair of swing doors. Separate, large, blast-resistant metal swing doors and vertical lift doors are also notable features of the building. Two-light fixed windows with tinted, tempered glass are on the second and third floors. Resource 8BR01998 retains its integrity and remains in excellent condition.

The SRB ARF Manufacturing Building #L6-0247 is used to assemble the non-propellant booster elements, such as the forward and aft skirts, nose caps, and thrust vector control components. The facility is also used for the refurbishing and upgrading of hardware. Other operations include the application of the insulation (thermal protection system) and installation of electronic and guidance systems (NASA 2020). It measures approximately 357 feet in length, 252 feet in width, and has an overall height of 60.5 feet (Deming and Slovinac 2007). The building, along with the rest of the SRB AFR complex, was dedicated in 1986, and SRB component processing began in 1987. It was designed by Reynolds, Smith, and Hill with assistance from United Space Boosters Inc., who also managed the constriction along with the Federal Construction Company (Deming and Slovinac 2007).

Assessment

The SRB ARF Manufacturing Building #L6-0247 (8BR01998) is a previously recorded property that was evaluated as eligible for listing in the NRHP with SHPO concurrence on May 27, 2008, for its historic significance relating to transportation/aerospace under NRHP Criterion A and Criteria Consideration G, as it achieved historic significance in less than 50 years (Deming and Slovinac 2007).



Figure 18. Representative views of Resource 8BR01998. Top: facing southeast; bottom: facing northeast.

SEARCH did not reassess the significance of Resource 8BR01998 as it has not changed in any appreciable way since its previous recordation and evaluation of eligibility. However, SEARCH is providing an effects analysis based upon the resource's NRHP eligibility status.

Effects

The character-defining features of Resource 8BR01998 include its design and construction, which are specifically engineered for the fabrication and processing of inert or non-propellant SRB elements of the Space Shuttle. SpaceX is proposing to expand its existing operations area between Roberts Road and Schwartz Road, which is located approximately 1.6 km (1 mi) southwest of Resource 8BR01998. The proposed project will not remove or alter any elements that contribute to the historic significance of the SRB ARF Manufacturing Building #L6-0247. As such, SEARCH anticipates no adverse effects from the proposed project to its character-defining features.

NASA Railroad at KSC (8BR02931) and NASA KSC Railroad System Historic District (8BR02932)

The previously recorded NASA Railroad at KSC (8BR02931) and NASA KSC Railroad System Historic District (8BR02932) are colocated near the northeastern limit of the APE just south of Schwartz Road and follow the same alignment to the north outside of the current APE. However, as originally documented by Deming et al. (2012:3-32–3-33), the segment of the NASA Railroad at KSC (8BR02931) to the south, including the segment of the resource within the APE, is not included within the NASA KSC Railroad System Historic District (8BR02932). The NASA Railroad at KSC (8BR02931) is a contributing resource to the NASA KSC Railroad System Historic District (8BR02932) but is not individually NRHP-eligible. As noted above, the FMSF GIS database erroneously depicts 8BR02932 extending through the current APE. The NASA KSC Railroad System Historic District (8BR02932) also has six additional contributing components (one bridge, two railcars, and three locomotives), none of which are within the APE. Construction of the railroad system began in 1963 and was substantially complete by 1965 (Deming et al. 2012). The segment of Resource 8BR02931 within the architectural APE measures 3.0 km (1.9 mi) in length and is in Sections 19, 30, and 31 of Township 22 South, Range 37 East, as shown on the 2021 Orsino, Fla USGS quadrangle map. The total length of Resource 8BR02931 is approximately 30.5 km (19.0 mi), with the tracks extending to the north and south of the APE. Resource 8BR02932 and the contributing segment of 8BR02931 terminate outside the northeastern boundary of the APE and continue outside of the APE to the north. Representative views of Resource 8BR02931 within the APE are included in Figure 19.

The section of Resources 8BR02931 and 8BR02932 from the mainline of FEC Railway to the Wilson Yard were built by the FEC Railway. The Wilson Yard was near the present location of SR 402 North and Kennedy Parkway North. The remainder of the railway was contracted to be built for NASA by two Jacksonville, Florida, companies: B. B. McCormick and Bailes-Sey (Slovinac 2013). The NASA-built section of the railroad is comprised of two primary branches, an east branch and a west branch. The east branch extends towards Playalinda Beach and then south along the beach

toward Launch Complex 39: Pads A and B. The west branch extends south from near the intersection of SR 402 north and Kennedy Parkway North past the Vehicle Assembly Building to the KSC industrial area (Slovinac 2013). Much of the east branch is considered to lack integrity, as the railway tracks were removed and replaced between 1986 and 1993 by Playalinda Beach Road leading to a section of the Canaveral National Seashore (FDOT 1986, 1993). The road was constructed on top of the original railway grade. The west branch is considered to have greater significance as it is substantially intact and retains character-defining features consisting of ballast, cross ties, rails, and tie plates. A number of specially designed NASA railcars remain on the KSC property; however, none are located within the APE. Lastly, a section of non-historic track was built between 1986 and 1993 and is adjacent to the alignment of SR 402 North that extends east from Playalinda Beach Road to Resources 8BR04422 and 8BR04423.

Assessment

The previously recorded NASA Railroad at KSC (8BR02931) and NASA KSC Railroad System Historic District (8BR02932) were both previously recommended NRHP eligible near the northeastern terminus of the current project APE and extending north outside of the APE. They were recommended for their historic significance relating to transportation under NRHP Criterion A, and the SHPO concurred with these findings on October 23, 2012 (Deming et al. 2012). The segment of NASA Railroad at KSC (8BR02931) extending south through the current APE was previously determined a non-contributing segment of the NRHP-eligible district (Deming et al. 2012). SEARCH did not reassess the significance of Resources 8BR02931 and 8BR02932 as they have not changed in any appreciable way since originally constructed; however, SEARCH has updated the mapping for 8BR02932 to reflect its originally intended terminus outside of the current APE. The only changes to the tracks are recorded as switching the rails from bolted to welded connections and replacing the wood ties with concrete ties, both of which are part of railroad maintenance that is required to prolong the service life of the resource (NASA 2011). As the portion of Resource 8BR02931 within the APE has been previously evaluated for NRHP eligibility, a full reevaluation was considered outside of the current project scope and was not completed. However, SEARCH is providing an effects analysis based upon the resource's NRHP eligibility near the northeastern terminus of the APE.

Effects

The segment of the NASA Railroad at KSC (8BR02931) within the APE is outside of the NASA KSC Railroad System Historic District (8BR02932) and therefore does not contribute to the eligibility of that district. Resource 8BR02931 was previously evaluated as individually ineligible for listing the NRHP. SpaceX plans to expand its existing operations area along Roberts Road, which is approximately 1.6 km (1.0 mi) from the nearest contributing segments of 8BR02931 and from 8BR02932. The proposed project is consistent with what is already present within 8BR02931 and will not remove or alter any elements that contribute to the historic significance of the resource. As such, SEARCH anticipates no adverse effects from the proposed project to the character-defining features of the resource.



Figure 19. Representative view of Resource 8BR02931, facing south (top and bottom).

Roberts Road Footbridge (8BR04443)

Resource 8BR04443 is a newly recorded pedestrian bridge in Brevard County within the architectural APE. The culvert crosses a ditch on the north side of Roberts Road adjacent to a solar field within the KSC in Section 25 of Township 22 South, Range 36 East, as shown on the 2021 *Orsino, Fla.* USGS quadrangle map. Resource 8BR04443 is a small, single-span arch deck bridge with a total length of approximately 4.87 m (16 ft) and a total width of approximately 3.04 m (10 ft) (**Figure 20**). The bridge is a simple, fixed, unadorned structure built of limestone and concrete. There are slots visible on the remaining sections of the lower stone railing that once provided for taller railing, most likely made of wood, which is no longer extant. A combination of limestone and concrete form the abutment and the arch. The bridge was constructed with reinforcing steel rods, as these are visible on the deteriorated section of the lower railing. Any footpath that once led to and from the bridge is no longer present, and overgrown vegetation and a fence enclosing the solar field is immediately to the north. The bridge has been out of use for many years based on the highly deteriorated condition of the structure.

Although the precise construction date for Resource 8BR04443 is unknown, it is visible on the 1943 aerial at a time when orange groves and a home site were to the north of the bridge in the area that now comprises the modern solar field (USDA 1943). It appears that the bridge was constructed at a time when the land was still private property to provide access to the orange groves and house on the north side of Roberts Road.

Assessment and Effects

Based on available information and field research, Roberts Road Footbridge (8BR04443) does not appear to meet the minimum criteria for listing in the NRHP. The bridge does not possess sufficient historical significance under Criteria A or B to warrant inclusion in the NRHP. No additional information was located that details the bridge's role in the development of the area or its association with persons of historical significance. Furthermore, the resource lacks sufficient engineering and architectural distinction to be significant under Criterion C, as it is a small utilitarian footbridge that does not embody the distinctive characteristics of a method of construction or serve as an excellent example of bridge design. Additionally, 8BR04443 is not significant under Criterion D, as it lacks the potential to yield further information of historical importance. Therefore, it is the opinion of SEARCH that Roberts Road Footbridge (8BR04443) is ineligible for listing in the NRHP, either individually or as part of a historic district. No further work is recommended for 8BR04443.



Figure 20. Representative views of Resource 8BR04443. Facing northeast (top left); facing north (top right); facing northwest (bottom left); facing northeast (bottom right).

Kennedy Space Center Communication Tower (8BR04444)

The KSC Communication Tower (8BR04444) is a newly recorded structure within the architectural APE. It is within Section 24 of Township 22 South, Range 36 East, as shown on the 2021 *Orsino, Fla* USGS quadrangle map. Resource 8BR04444 is a ca. 1965 multi-story tower that is set on a concrete slab foundation. The tower has a square plan and is comprised of a steel skeleton with nine separate metal stairs leading to nine metal platforms along the height of the structure, which is four and a half stories tall (**Figure 21**). A metal antenna is at the top, and meteorological sensors that gather weather data, including wind speed, are near the top of the tower and approximately one story from the bottom. Multiple metal guy wires are present to aid in the stability of the structure. The structure also serves as a communications tower to gather meteorological data, and it remains in active use (Jeanne M. Ryba, personal communication 2022). The tower is owned by the United States Space Force, which is part of the Department of the Air Force.

To the north of the tower is a small, square concrete block building with a flat roof. This ancillary building is used to house equipment such as weather gauges for use on the tower (see **Figure 21**). It was constructed concurrently with the tower for this use. Building No. L6-0075 is posted on the north side of the building facing Schwartz Road.

Assessment and Effects

Based on available information and field research, Resource 8BR04444 does not appear to meet the minimum criteria for listing in the NRHP. The building does not possess sufficient historical significance under Criteria A or B to warrant inclusion in the NRHP. No additional information was located that details the building's role in the development of the area, specifically NASA missions or its association with persons of historical significance. There are numerous similar towers at the KSC for communication transmissions and gathering similar data. Furthermore, the resource lacks sufficient engineering and architectural distinction to be eligible under Criterion C, as it does not embody the distinctive characteristics of a method of construction or serve as an excellent example of a particular style. Additionally, 8BR04444 is not significant under Criterion D, as it lacks the potential to yield further information of historical importance. Therefore, it is the opinion of the SEARCH that 8BR04422 is not eligible for listing in the NRHP, either individually or as part of a district. No further work is recommended for 8BR04444.



Figure 21. Representative views of Resource 8BR04444. Top: facing south; bottom: facing southeast.
CONCLUSIONS AND RECOMMENDATIONS

In October 2021 and May 2022, SEARCH conducted a Phase I CRAS on behalf of SpaceX in support of the development of the Roberts Road north expansion area and NASA Parkway connector within the KSC in Brevard County, Florida. The archaeological APE included these two project footprints, and the architectural APE was defined as a 1.6 km (1.0 mi) buffer around the Roberts Road north expansion area plus the footprint of the NASA Parkway connector.

The architectural survey resulted in the identification and evaluation of four resources within the architectural APE, including two previously recorded resources and two newly recorded resources. The two previously recorded resources include the NASA Railroad at KSC (8BR02931) and the NRHP-eligible SRB ARF Manufacturing Building #L6-0247 (8BR01998). The newly recorded resources include one bridge (8BR04443) and one tower structure (8BR04444). Resources 8BR04443 and 8BR04444 are recommended ineligible for listing in the NRHP. Resource 8BR02931 is not individually eligible for listing the NRHP but portions are considered a contributing resource to the NASA KSC Railroad System Historic District (8BR02932). Resource 8BR02932 was erroneously mapped within the APE within the FMSF GIS database, but the documentation associated with its original record demonstrates that it does not extend into the current APE. As such, the portion of the railroad (8BR02931) within the APE does not contribute to the eligibility of the district (8BR02932). Therefore, it is SEARCH's opinion that the proposed project poses no adverse effect to NRHP-eligible resources. No further architectural resource work is recommended.

Most terrain within the archaeological APE was wet or inundated during both field visits. One shovel test was excavated along the east boundary of the Roberts Road north expansion area, which corresponds to the area of highest elevation within the archaeological APE. No artifacts were observed in the shovel test or on the ground surface, and in SEARCH's opinion, significant archaeological sites are unlikely to be present within the archaeological APE.

Based on the results of the survey, it is the opinion of SEARCH that the proposed project will have no adverse effect on historic properties. No further cultural resources investigations are recommended. This page intentionally left blank.

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APPENDIX A:

FMSF SITE FORMS

Page 1 ☐ Original ⊠ Update		HISTORICAL FLORIDA Ver Shaded Fields represent the Consult the Guide to Historic	STRUCTURI MASTER SITE F sion 5.0 3/19 minimum acceptable level of cal Structure Forms for detail	E FORM ILE f documentation. led instructions.
Site Name(s) (ad Survey Project N National Registe Ownership: □priv	dress if none) <u>SRB</u> ARF lame <u>CRAS for Spac</u> r Category (please check one) rate-profit □ private-nonprofit [Manufacturing Bu: eX Roberts Road No: Distructure Structure Iprivate-individual Iprivate-nor	ilding rth district site nspecific city county	Mu Su state ⊠federa
Address: #L Cross Streets (ne USGS 7.5 Map N City / Town (within Township _22S Tax Parcel # _N Subdivision Nam UTM Coordinate Other Coordinate	Number Direction S 5-0247 1 barest / between) E side of a sid	LOCATIO	N & MAPPING Street Ty enter S of Schwartz Rd USGS Date 2021 P Provide Street Ty S Dyes Mono Dunki NW SW SE Landgrant Block frithing Coordinate System &	rpe S Plat or Other Ma nown County □NE Irregula N/A □ Datum
Construction Yea	ar: <u>1986</u> D approx	HIS kimately □year listed o	STORY r earlier □year liste	ed or later
Original Use O Current Use O Other Use O Moves: Oye Alterations: Oye Additions: Oye	ther SRB Assembly and B s Xno Uunknown Da s Xno Uunknown Da s Xno Uunknown Da	Refurbishment te: Origina te: Nature te: Nature	From (year): 198 From (year): 198 From (year): 198 al address	6 To (yea 6 To (yea 6 To (yea
Architect (last nan Ownership Histo National Ae	ne first): <u>Reynolds</u> , Sm: TY (especially original owner, da eronautics and Spa	ith and Hills tes, profession, etc.) ce Administration	Builder (last name fin	st): <u>Booster</u>
Is the Resource	Affected by a Local Preser	vation Ordinance?	RIPTION	escribe
Style Industri Exterior Fabric(s Roof Type(s) Roof Material(s)	rial Vernacular 1. <u>Metal</u> 1. Flat 1. Built-up dary stuces (dormers atc.) 1	Exterior F 2. Conc 2. 2. 2.	Plan Irregular rete block	3 3 3
Windows (types, n	naterials, etc.)	tinted tempered	alogg on the gos	

Site#8	BR01998
Field Date	5-6-2022
Form Date	5-10-2022
Recorder #	

Multiple Listing (DHR only) ____ Survey # (DHR only) _____

Ownership: Drivate-p	rofit private-nonprofit private-individual	private-nonspecific city	county state	Federal N	ative American	foreign 🗖 u	Inknown
	LOG	CATION & MAPI	PING				
Street Num Address: #L6 - 0 Cross Streets (nearest	ber Direction Street Name 247 Kennedy Sp / between) E side of Contracto	ace Center r Rd, S of Schwai	Street Type	Suffix D	irection		
USGS 7.5 Map Name	ORSINO	USGS Date _2	<u>021</u> Plat or	Other Map	<u>_</u>		
City / Town (within 3 mi	les) Titusville In (City Limits? Dyes Inc		County Br	evard		
Township $22S$	Range $37E$ Section 19 $\frac{19}{4}$	section: LINVV LISVV	USE UNE	Irregular-nar	ne:		
Subdivision Name N	/A	Ean	ock	N/A	Lot	N/A	
UTM Coordinates: Zo Other Coordinates: >	ne □16 □17 Easting □ □ □ K: Y:	Northing Coordinate S	ystem & Datur	n			
	(e.g., park)						
		HISTORY					
Construction Year: Original Use Othe Current Use Othe Other UseSRB Moves:yes D	<u>1986</u> approximately year r Assembly and Refurbishmen	ar listed or earlier From (year):_ From (year):_ t_ Original address	year listed or la 1986 1986 1986	ater To (year): To (year): To (year):	2022 2022 2022		
Alterations: yes D	no unknown Date:	Nature					
Additions: yes	Ino □unknown Date:	_ Nature	at name first): B	ooster Pro	duction C		
Ownership History (e	specially original owner, dates, profession, etc.)					0.	
National Aeror	nautics and Space Administr	ation (NASA)					
Is the Resource Affect	ted by a Local Preservation Ordinance	? Lyes Xno Lunkn	own Describe	9			
		DESCRIPTION					
Style Industria	l Vernacular	Exterior Plan Irregu	lar		Number of S	Stories	3
Exterior Fabric(s) 1.	Metal	2. Concrete block	<u> </u>	3			
Root Lype(s) 1.	<u>Flat</u>	2		3			
Roof secondary	strucs. (dormers etc.) 1.	۷	2.	J			
Windows (types, materia	als, etc.)						
Two-light fixe	ed windows with tinted, tem	pered glass on t	he second	and third	floors		
Distinguishing Archite							
Not Applicable	ecturial reatures (exterior or interior ornamen	(S)					
Ancillary Features / C	Jutbuildings (record outbuildings, major landso	cape features; use continuatior	n sheet if needed.)				
Form part of t north and a wa	he Booster Fabrication Fac arehouse to the south.	cility (BFF): an	air chille	er building	g is locat	ed to t	he
DHR	USE ONLY OF	FICIAL EVALUATI	ON	D	HR USE ON	ILY	
NR List Date	SHPO – Appears to meet criteria for NR	listing: 🛛 yes 🗖 no 🗖	insufficient info	Date		Init.	
	KEEPER – Determined eligible:	□yes □no		Date			
Owner Objection	NR Criteria for Evaluation:	Lc Ld (see Nationa	ai Register Bulle	etin 15, p. 2)			

HISTORICAL STRUCTURE FORM

Site #8 BR01998

	DESCR	IPTION (continu	ed)			
Chimney: No. 0 Chimney Ma	aterial(s): 1.	2.				
Structural System(s): 1. Sk	eleton-steel	2. Concrete bloc	ck 3.	Concrete		
Foundation Type(s): 1. Co:	ntinuous	2.				
Foundation Material(s): 1. Por	ured Concrete Footing	2				
Main Entrance (stylistic details)						
N side, pedestrian en	trance with double met	al doors				
Porch Descriptions (types, locations	s, roof types, etc.)					
Not Applicable						
Condition (overall resource condition) Narrative Description of Resource	:⊠excellent ⊡good ⊡fair ce	deteriorated	ruinous			
Resource 8BR01998 is	a steel and concrete b	lock building de	esigned to manu	afacture, assemble, and		
and features a tall c	entral bay flanked by	r components. The three-story wind	ne bullding is	168,014 square leet		
Archaeological Remains				Check if Archaeological Form Completed		
	RESEARCH MI	ETHODS (select a	ll that apply)			
SEMSE report search (sites/su			ormito			
TEL State Archives/photo colle			owner interview			
Sproperty appraiser / tax recor	ds Inewspaper file	s 🛛 neiahbor	interview	Public Lands Survey (DEP)		
Ecultural resource survey (CR)	AS) historic photos	□interior in	spection	HABS/HAER record search		
E other methods (describe) Ped	lestrian/Windshield Sur	vey	·			
Bibliographic References (give FI	MSF manuscript # if relevant, use continu	ation sheet if needed)				
Previous site forms f Manufacturing Buildin	or 8BR01998; Solid Roc ng HAER	ket Booster Ass	embly and Refu	rbishment Facility		
	OPINION OF RE	ESOURCE SIGN	IFICANCE			
Appears to meet the criteria for Appears to meet the criteria for Evolution of Evolution (National Register listing individua National Register listing as part o	Ily? Xyes f a district? Yes	□no □insuffici □no □insuffici	ent information ent information		
Explanation of Evaluation (requir	ed, whether significant or not; use separa	ite sheet if needed)				
Space Shuttle Program the last 50 years, Cr	in the area of space riteria Consideration G	exploration. As applies.	it has achieve	ed significance within		
Area(s) of Historical Significance	e (see National Register Bulletin 15, p. 8 3. Transport	for categories: e.g. "architect	ure", "ethnic heritage", "co 5	mmunity planning & development", etc.)		
2. Engineering	<u>3. 11485p013</u> 4. Other		0 6.			
		ΙΜΕΝΤΑΤΙΟΝ				
		UMENTATION				
Accessible Documentation Not P	-Iled with the Site File - including fie	eld notes, analysis notes, pho	otos, plans and other impor	tant documents		
1) Document description Photos	, Maps, Field Notes, Ae	eria File or accession #	s R21181			
Document type		Maintaining organiza	ition			
Document description		File or accession #	'S			
RECORDER INFORMATION						
Recorder Name <u>Newton</u> , Ja	ason	Affiliation S	outheastern Archaeologica	al Research		
Recorder Contact Information (address / phone / fax / e-mail)	3117 Edgewater Dr., Or	lando, FL 32804,	/754-206-1056/	jason.newton@searchinc.c		
	O USGS 7.5' MAP WITH	STRUCTURE I O	CATION CI FARI	Y INDICATED		
Required	2 LARGE SCALE STDE			from most property appraiser web sites)		
Attachmonte		CADE DICITAL IN		nom most property appraiser web sites/		
Allaciments		JADE, DIGITAL IM		format ()		
	Digital image must be at lea	st 1600 x 1200 pixels	24-hit color, ineq or ti	ff		
	Digital intrage introl be at lea	1200 pixels,				



8BR01998_a Facing Southeast



8BR01998_b Facing East



8BR01998_c Facing Northeast



8BR01998_d Facing Northeast



8BR01998_e Facing East



8BR01998_f Facing East



 Architectural APE
 Previously Recorded Historic Building Previously Recorded Linear Resource

BR02931

Meters Feet
USDA-FSA-APFO Orthophoto
Mosaic (2021); FMSF (4/2022)



Page 1



RESOURCE GROUP FORM FLORIDA MASTER SITE FILE Version 5.0 3/19

Site #8 BR02931 Field Date 5-6-2022 Form Date 5-10-2022 Recorder#

Consult the Guide to the Resource Group Form for additional instructions

NOTE: Use this form to document districts, landscapes, building complexes and linear resources as described in the box below. Cultural resources contributing to the Resource Group should also be documented individually at the Site File. **Do not use this form for National Register multiple property submissions** (MPSs). National Register MPSs are treated as Site File manuscripts and are associated with the individual resources included under the MPS cover using the Site File manuscript number.

Check ONE box that best describes the Resource Group:

- Historic district (NR category "district"): buildings and NR structures only: NO archaeological sites
- Archaeological district (NR category "district"): archaeological sites only: NO buildings or NR structures
- **Mixed district** (NR category "district"): includes more than one type of cultural resource (example: archaeological sites and buildings)
- **Building complex** (NR category usually "building(s)"): multiple buildings in close spatial <u>and</u> functional association
- Designed historic landscape (NR category usually "district" or "site"): can include multiple resources (see *National Register Bulletin #18*, page 2 for more detailed definition and examples: e.g. parks, golf courses, campuses, resorts, etc.)
- □ Rural historic landscape (NR category usually "district" or "site"): can include multiple resources and resources not formally designed (see *National Register Bulletin #30, Guidelines for Evaluating and Documenting Rural Historic Landscapes* for more detailed definition and examples: e.g. farmsteads, fish camps, lumber camps, traditional ceremonial sites, etc.)
- Linear resource (NR category usually "structure"): Linear resources are a special type of structure or historic landscape and can include canals, railways, roads, etc.

Resource Group Name NASA Railroad at Kennedy Space Center	_ Multiple Listing [DHR o	only]
Project Name CRAS for SpaceX Roberts Road North	FMSF Surv	'ey #
National Register Category (please check one): Duilding(s) Estructure district site	□object	
Linear Resource Type (if applicable): Canal railway Croad Cother (describe):		
Ownership: private-profit private-nonprofit private-individual private-nonspecific city county state	Sederal Native American	ı ∎foreign ∎unknown

LOCATION & MAPPING						
Street Number Direction Street Name Street Type Suffix Direction						
Address:						
City/Town (within 3 miles)Titusville In Current City Limits? 🗖 yes 🗷 no 🗖 unknown						
County or Counties (do not abbreviate)_Brevard						
Name of Public Tract (e.g., park)						
1) Township 22S Range 37E Section 19 1/4 section: NW SW SE NE Irregular-name:						
2) Township 22S Range 37E Section 30 1/4 section: NW SW SE NE						
3) Township 22S Range 37E Section 31 1/4 section: NW SW SE NE						
4) Township Range Section ¹ / ₄ section: DNW DSW DSE DNE						
USGS 7.5' Map(s) 1) Name ORSINO USGS Date 2021						
2) Name USGS Date						
Plat, Aerial, or Other Map (map's name, originating office with location)						
Landgrant						
Verbal Description of Boundaries (description does not replace required map)						
This segment of 8BR02931 runs parallel to Kennedy Parkway North and is 1.9 miles in length						
through the APE.						

DHR	JSE ONLY	OFFICIAI	L EVALUA	TION	DHR	USE ONLY
NR List Date	SHPO – Appears to meet criteria fo	r NR listing:	lyes ⊡no	□insufficient info	Date	Init
Owner Objection	NR Criteria for Evaluation:	⊡b ⊡c ⊡]yes ∐no]d (see <i>Na</i>	tional Register Bulletin	15, p. 2)	

Page 2	RESOURCE G	ROUP FORM	Site #8 BR02931
	HISTORY & I	DESCRIPTION	
Construction Year: <u>1963</u> Architect/Designer: <u></u> Total number of individual re Time period(s) of significanc 1. <u>Modern (Post 195</u> 2. Narrative Description (<i>Nationa</i> The section of Resc Wilson Yard was but for NASA, which is	Mapproximatelyyear listed or e sources included in this Resource Group: # e (choose a period from the list or type in date range(s 0) al Register Bulletin 16A pp. 33-34; attach supplementar burce 8BR02931 from the mainli ilt by the FEC Railway, and th comprised of two primary bran	arlieryear listed or later Builder: of contributing0 # of no), e.g. 1895-1925) 3 4 y sheets if needed) ne of Florida East Coast (File e remaining sections were conches.	n-contributing1 EC) Railway to the ontracted to be built
	RESEARCH METHOI	DS (check all that apply)	
 ☑FMSF record search (site □FL State Archives/photo of □property appraiser / tax re ☑cultural resource survey ☑other methods (specify) _ Bibliographic References (given by the second second	es/surveys) collection collection cords Pedestrian/ windshield survey we FMSF Manuscript # if relevant)	☐building permits ☐occupant/owner interview ☐neighbor interview ☐interior inspection	Sanborn maps plat maps Public Lands Survey (DEP) HABS/HAER record search
Potentially eligible individual Potentially eligible as contrib Explanation of Evaluation (re	OPINION OF RESOU ly for National Register of Historic Places? utor to a National Register district? quired, see National Register Bulletin 16A p. 48-49. At	Image: Second system Image: Second system <th< td=""><td>ation ation vt.)</td></th<>	ation ation vt.)
The segment of 8BR0 NRHP-eligible lines outside the project	02931 within the APE was deter ar resource in 2012. A full re scope.	mined non-contributing to the resource	he overall was considered
Area(s) of Historical Significa 1. <u>Transportation</u> 2.	ance (see National Register Bulletin 15, p. 8 for catego 3 4	ories: e.g. "architecture", "ethnic heritage", "commu 5 6	nity planning & development", etc.)
	DOCUME	NTATION	
Accessible Documentation N 1) Document type <u>All mat</u> Document description <u>Phot</u> 2) Document type Document description	Not Filed with the Site File - including field notes, erials at one location os, Maps, Field Notes, Aeria	analysis notes, photos, plans and other important of Maintaining organization <u>Southeastern Archaeolo</u> File or accession #'s <u>R21181</u> Maintaining organization File or accession #'s	documents gical Research
	RECORDER I	NFORMATION	
Recorder Name <u>Newton</u> , Recorder Contact Informatio (address / phone / fax / e-mail)	Jason n <u>3117 Edgewater Dr., Orlando</u>	_ Affiliation <u>Southeastern Archaeological Res</u> o, FL 32804/754-206-1056/jas	search on.newton@searchinc.c
Required Attachments	 PHOTOCOPY OF USGS 7.5' MAP LARGE SCALE STREET, PLAT O TABULATION OF ALL INCLUDED category, street address or other locati PHOTOS OF GENERAL STREETS When submitting images, they must be Digital images must be at least 1600 x 	WITH DISTRICT BOUNDARY CLE/ R PARCEL MAP WITH RESOURCE O RESOURCES - Include name, FMSF on information if no address. SCAPE OR VIEWS (Optional: aerial pho e included in digital AND hard copy forma 1200 pixels, 24-bit color, jpeg or tiff.	ARLY MARKED S MAPPED & LABELED #, contributing? Y/N, resource otos, views of typical resources) t (plain paper grayscale acceptable).



8BR02931_a Facing South



8BR02931_b Facing South



8BR02931_c Facing Northeast



 Architectural APE
 Previously Recorded Historic Building Previously Recorded Linear Resource

BR02931

Meters Feet
USDA-FSA-APFO Orthophoto
Mosaic (2021); FMSF (4/2022)



Page 1

□Original ⊠Update



RESOURCE GROUP FORM FLORIDA MASTER SITE FILE Version 5.0 3/19

Site #8 BR02932 Field Date 5-6-2022 Form Date 5-10-2022 Recorder#

Consult the Guide to the Resource Group Form for additional instructions

NOTE: Use this form to document districts, landscapes, building complexes and linear resources as described in the box below. Cultural resources contributing to the Resource Group should also be documented individually at the Site File. **Do not use this form for National Register multiple property submissions** (MPSs). National Register MPSs are treated as Site File manuscripts and are associated with the individual resources included under the MPS cover using the Site File manuscript number.

Check ONE box that best describes the Resource Group:

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- Archaeological district (NR category "district"): archaeological sites only: NO buildings or NR structures
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- **Building complex** (NR category usually "building(s)"): multiple buildings in close spatial <u>and</u> functional association
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- Rural historic landscape (NR category usually "district" or "site"): can include multiple resources and resources not formally designed (see National Register Bulletin #30, Guidelines for Evaluating and Documenting Rural Historic Landscapes for more detailed definition and examples: e.g. farmsteads, fish camps, lumber camps, traditional ceremonial sites, etc.)
- Linear resource (NR category usually "structure"): Linear resources are a special type of structure or historic landscape and can include canals, railways, roads, etc.

Resource Group Name_NASA_KSC_Railroad_System_HD Project Name_CRAS_for_SpaceX_Roberts_Road_North						e Listing [DHR only] FMSF Survey #
National Register Category (please check one):	□building(s)	≤structure	district	□site	□object	
Linear Resource Type (if applicable):	ĭ≍railway	□road □	other (descril	be):		
Ownership: private-profit private-nonprofit priv	ate-individual 🔲	private-nonspecific	city □co	unty 🗖 stat	e 🗙 federal	Native American foreign unknown
	IOC					

			LU	CATION & MAFFING		
Address:	<u>Street Number</u>	<u>Direction</u>	Street Name	Street Type Suffix Direction		
Audress.						
City/ I own (within 3 miles)	usville		In Current City Limits? Liyes 🗷 no Liunknown		
County or C	ounties (do not abbi	reviate) <u>Br</u>	evard			
Name of Pu	blic Tract (e.g., parl	<)				
1) Township	22S Range	37E	Section 19	1/4 section: NW SW SE NE Irregular-name:		
2) Township		e	Section	¼ section: □NW □SW □SE □NE		
3) Township)	Section	¼ section: □NW □SW □SE □NE		
4) Township		e	Section	¼ section: □NW □SW □SE □NE		
U SGS 7.5' I	Map(s) 1) Name	ORSINO		USGS Date _2021_		
	2) Name			USGS Date		
Plat, Aerial, or Other Map (map's name, originating office with location)						
Landgrant_						
Verbal Description of Boundaries (description does not replace required map)						
This see	gment of 8BR	02932 er	nds at the pr	oject APE boundary just south of Schwartz Road.		

DHR	USE ONLY	OFFICIAL	EVALUATION	DHR USE	ONLY
NR List Date	SHPO – Appears to meet criteria fo	r NR listing:	yes □no □insufficient info	Date	Init
Owner Objection	NR Criteria for Evaluation:	⊡b ⊡c ⊡	d (see National Register Bullet	<i>tin 15</i> , p. 2)	

RESOURCE GROUP FORM

Site #8 BR02932

HISTORY & DESCRIPTION	HIST	ORY	& D	DESC	RIP	TION
-----------------------	------	------------	-----	------	-----	------

Construction Year: <u>1963</u> Architect/Designer: <u> </u> Total number of individual re Time period(s) of significance 1. <u> </u> 2. <u> </u> Narrative Description (<i>Nationa</i> The section of Resc Wilson Yard was built for NASA, which is	⊠approximately sources included in this R e (choose a period from the list al Register Bulletin 16A pp. 33-3 purce 8BR02932 frc ilt by the FEC Ra: comprised of two	year listed or earlie Bu Resource Group: # of c or type in date range(s), e.g 	ets if needed) of Florida East Co remaining sections es.	# of non-contributing0
	RESEAR	CH METHODS	(check all that appl	y)
 ☑FMSF record search (site □FL State Archives/photo c □property appraiser / tax re ☑cultural resource survey ☑other methods (specify) _ Bibliographic References (given 	s/surveys) collection cords Pedestrian/ winds ve FMSF Manuscript # if relevan	ary research directory vspaper files toric photos hield survey nt)	☐building permits ☐occupant/owner interview ☐neighbor interview ☐interior inspection	□Sanborn maps v □plat maps □Public Lands Survey (DEP) □HABS/HAER record search
		N OF RESOUR	CE SIGNIFICANCI	
Potentially eligible individuall Potentially eligible as contrib Explanation of Evaluation (rea Resource 8BR02932 w Criterion A in the outside the project Area(s) of Historical Significa 1. Transportation 2.	y for National Register of utor to a National Register quired, see National Register Bu vas determined eli area of Transport <u>scope</u> . ance (see National Register Bu 333	Historic Places? [r district? [<u>ulletin 16A p. 48-49. Attach</u> igible for list: zation. A full : <u>ulletin 15, p. 8 for categories</u>	yes ☐no ☐insuffi lyes ⊠no ☐insuffi longer statement, if needed, on se ing in the NRHP on re-evaluation of th 	cient information cient information parate sheet.) October 23, 2012 under e resource was considered e", "community planning & development", etc.)
		DOCUMENT	ΓΑΤΙΟΝ	
Accessible Documentation N 1) Document type <u>All mathematical mathema</u>	lot Filed with the Site File erials at one loc os, Maps, Field N	- including field notes, anal ation Maint [otes, Aeria File Maint File ECORDER INF	lysis notes, photos, plans and other taining organization <u>Southeastern</u> or accession #'s <u>R21181</u> taining organization <u>sourcession</u> #'s <u>SORMATION</u>	r important documents n Archaeological Research
Recorder Name <u>Newton</u> , Recorder Contact Information (address / phone / fax / e-mail)	Jason n _3117 Edgewater	Dr., Orlando,	Affiliation Southeastern Archae	ological Research 56/jason.newton@searchinc.cm
Required Attachments	 PHOTOCOPY OF LARGE SCALE S TABULATION OF category, street add PHOTOS OF GEN When submitting im Digital images must 	USGS 7.5' MAP WI TREET, PLAT OR F ALL INCLUDED R ress or other location i VERAL STREETSC/ ages, they must be inc be at least 1600 x 12(ITH DISTRICT BOUNDA PARCEL MAP WITH RES ESOURCES - Include nam information if no address. APE OR VIEWS (Optional: cluded in digital AND hard cc 00 pixels, 24-bit color, jpeg c	RY CLEARLY MARKED SOURCES MAPPED & LABELED ne, FMSF #, contributing? Y/N, resource aerial photos, views of typical resources) opy format (plain paper grayscale acceptable). or tiff.



8BR02932_a Facing North



 Architectural APE
 Previously Recorded Historic Building Previously Recorded Linear Resource

BR02931

Meters Feet
USDA-FSA-APFO Orthophoto
Mosaic (2021); FMSF (4/2022)



Page 1 ⊠Original □Update	HISTORICA FLORIDA Ver Consult Guide to the Histo	AL BRIDGE FOR MASTER SITE FILE rsion 5.0 3/19 rical Bridge Form for detailed instructio	M Site #8 Field Date _ Form Date _ Recorder # FDOT Bridg	BR04443 5-6-2022 5-10-2022 e#
Bridge Name(s) <u>Roberts</u> Project Name <u>CRAS</u> for Sp Ownership: private-profit priva	Road Footbridge aceX Roberts Road North e-nonprofit private-individual private-no	nspecific city county state	Multiple Listing (DHF Survey # (DHR only) ⊠federal □Native Americar	₹only) / n □foreign □unknown
Route(s) Carried/Feature(s) Cro USGS 7.5 Map Name_ORSING City/Town (within 3 miles)itus Township Range36E Township Range Landgrant UTM Coordinates: Zone16 Other Coordinates: X: Name of Public Tract (e.g., park)_	Ssed Former path over canady ville In City Limits Section 25 1/4 section: Section 1/4 section: In 17 Easting In Y: Y: In	N & MAPPING al/ditch on N side Ro USGS Date 2021 Plat or O s?yes Inounknown WSWSENE WSWSENE Tax Parcel # Northing _ Coordinate System & Datum	berts Road ther Map County _Brevard Irregular-name:	
Year Built <u>1943</u> □ap Still in use? □yes ⊠no □ Prior Fords, Ferries, or Bridges No prior bridge known	proximately X year listed or earlie restricted use (describe) at this Location at this location.	er Uyear listed or later		
Bridge Use: original and current Pedestrian Ownership history Previous ownership-Pr	with dates (standard descriptions: auto, rai	ilway, pedestrian, fishing pier, abandon Federal (NASA)	ed)	
Designers/Engineers <u>Unknow</u> Builders/Contractors <u>Unknow</u> Text of Plaque or Inscription N/A	nn			
Narrative History (How did bridge c The bridge was origin the former orange gro and is in highly dete	ome to be built? How was it financed?, etc.) ally constructed to provi- ve and home site north of riorated condition.	de access from Robert the road. It has bee	s Road across th n out of use for	e ditch to many years
GENERAL Overall Bridge Design 1Ar Overall Condition □excellen Style and Decorative Details The bridge is a simp slots for extended r partially missing. Tender Station Description N/A	DESC chDeck t good fair Edeteriorated le, fixed, unadorned, str ailing, which is now miss	CRIPTION 2 Truinous ucture built of limes ing, located on the l	tone and concret ower stone raili	e. There are ng, which is
Alterations: Dates and Descrip Changes to the bridg Most of the railing	lions e appear to have come from has been removed.	m its abandonment and	subsequent dete	rioration.
DHR USE ONI NR List Date SHPO – KEEPER NR Criter	Y OFFICIAL Appears to meet criteria for NR listing: □ – Determined eligible: □ ia for Evaluation: □a □b □c □	. EVALUATION yes ☐no ☐insufficient info yes ☐no d (see National Register Bulletii	DHR USE (Date Date n 15, p. 2)	DNLY Init

HR6E052R0319, effective 05/2016 Rule 1A-46 F.A.C. Florida Master Site File / Div. of Historical Resources / R. A. Gray Bldg / 500 S Bronough St., Tallahassee, FL 32399-0250 Phone 850.245.6440 / Fax 850.245.6439 / E-mail SiteFile@dos.myflorida.com

HISTORICAL BRIDGE FORM

DESCRIPTION (continued)

Spans: Total Number Total Length(ft)6	
Main Spans: Number <u>1</u> Length(ft) <u>16</u> Width(ft) <u>10</u> Roadway width(ft) <u>Main Span Design ArchDeck</u> Main Span Materials 1. <u>Stone</u> 2. <u>Concrete</u>	
Approach Spans: Number Length(ft) Width(ft) Roadway width(ft) Approach Span Design Approach Span Materials 1. 2.	
Deck Materials 1Concrete 2	
SUBSTRUCTURE Abutment Materials 1. Concrete 2. Stone Abutment Description Limestone and concrete combination to form the abutment Pier Materials 1. Not Applicable 2. Pier Description 2.	ent/arch
Plei Description	
Image: Constraint of the sector of the se	□informal archaeological inspection □formal archaeological survey EP) ⊠cultural resource survey
OPINION OF RESOURCE SIGNIFICANCE Potentially eligible individually for National Register of Historic Places? Potentially eligible as contributor to a National Register district? Image: Second S	fficient information fficient information
Due to lack of sufficient historic significance and architectural/eng 8BR04443 is ineligible for listing in the NRHP, either individually o resource to a historic district.	jineering distinction, or as a contributing
Area(s) of historical significance (See National Register Bulletin 15, p. 8 for categories: e.g. "architecture", "ethnic heritageneric transmission of the second secon	ge", "community planning & development", etc.)
DOCUMENTATION	
Accessible Documentation Not Filed with the Site File - including field & analysis notes, photos, plans, other import 1) Document type All materials at one location Document description Photos, Maps, Field Notes, Aeria: File or accession #s R21181 - Document type	tant documents ern Archaeological Research
2) Document description File or accession #'s	
RECORDER INFORMATION	
Recorder Name Newton, Jason Affiliation Southeastern Archae Recorder Contact Information 3117 Edgewater Dr., Orlando, FL 32804/754-206-10 (address / phone / fax / e-mail)	eological Research 056/jason.newton@searchinc.c ₊
 Required Attachments USGS 7.5' TOPO MAP WITH BRIDGE LOCATION CLEA PHOTO OF BRIDGE When submitting an image, it must be included in digital <u>AND</u> hard co Digital image must be at least 1600 x 1200 pixels. 24-bit color, iped on 	ARLY MARKED opy format (plain paper grayscale acceptable).



8BR04443_a Facing Northeast



8BR04443_b Facing North



8BR04443_c Facing Northwest



8BR04443_d Facing Northeast





Page 1 Image: Site #8 BR04444 Image: Site #8 Brown Balance Image: Site #8 Brown Balance Site #8 Image: Site #8 Brown Balance Site #8 Image: Site #8 Brown Balance <
Site Name(s) (address if none) KSC Communications Tower Multiple Listing (DHR only) Survey Project Name CRAS for SpaceX Roberts Road North Survey # (DHR only) National Register Category (please check one) Istuiding Istructure Idistrict Iste Iobject Ownership: private-nonprofit private-individual private-nonspecific Icity Icounty Istate Image: Address if none)
LOCATION & MAPPING Street Number Direction Street Name Street Type Suffix Direction Address: #L6-0075 Kennedy Space Center Street Number Street Numer Street Numer <t< td=""></t<>
HISTORY Construction Year: 1965 Xapproximately year listed or earlier year listed or later Original Use Communications-related From (year): 1965 To (year): 2022 Current Use Communications-related From (year): 1965 To (year): 2022 Other Use From (year): 1965 To (year): 2022 Moves: yes Xno unknown Date: Original address Alterations: yes Xno unknown Date: Nature Additions: yes Xno unknown Date: Nature
Architect (last name first):
DESCRIPTION
Style No style Exterior Plan Square Number of Stories 4.5 Exterior Fabric(s) 1. Mumber of Stories 2. 3.
Distinguishing Architectural Features (exterior or interior ornaments) Steel structural tower for communications and weather equipment. Ancillary Features / Outbuildings (record outbuildings, major landscape features; use continuation sheet if needed.) Small CB weather equipment building to the N w/flat roof and metal door. Building number L6-0075 is posted on the N with an A/C unit inset on the S. DHR USE ONLY OFFICIAL EVALUATION
NR List Date SHPO – Appears to meet criteria for NR listing: yes no Disufficient info Date Init Owner Objection NR Criteria for Evaluation: a b c d (see National Register Bulletin 15, p. 2) Init

HISTORICAL STRUCTURE FORM

Site #8 BR04444

DESCRIPTION (continued)
Chimney: No0 Chimney Material(s): 1 2 Structural System(s): 1Skeleton-steel 2 Foundation Type(s): 1Slab 2 Foundation Material(s): 1Concrete, Generic 2 Main Entrance (stylistic details)
Metal stairs on the ground level with separate sets of stairs on each level above.
Porch Descriptions (types, locations, roof types, etc.) N/A
Condition (overall resource condition): □excellent ⊠good □fair □deteriorated □ruinous Narrative Description of Resource
Resource 8BR04444 is a steel skeleton tower used for communications and for measuring meteorological conditions. The ancillary building to the north is for storage of weather equipment.
Archaeological Remains Check if Archaeological Form Complete
RESEARCH METHODS (select all that apply)
Image: Search (sites/surveys) Image: Search (sites/surveys)
OPINION OF RESOURCE SIGNIFICANCE
Appears to meet the criteria for National Register listing individually? Appears to meet the criteria for National Register listing as part of a district? Explanation of Evaluation (required, whether significant or not; use separate sheet if needed) Due to lack of sufficient historic significance and architectural distinction, 8BR04444 is ineligible for listing in the NRHP, either individually or as a contributing resource within a pattern is district.
Area(s) of Historical Significance (see National Register Bulletin 15, p. 8 for categories: e.g. "architecture", "ethnic heritage", "community planning & development", etc.)
1 3 5 2 4 6
DOCUMENTATION
Accessible Documentation Not Filed with the Site File - including field notes, analysis notes, photos, plans and other important documents 1) Document type <u>All materials at one location</u> Maintaining organization Southeastern Archaeological Research 1) Document description Photos, Maps, Field Notes, Aeria File or accession #'s R21181
2) Document type Maintaining organization
Recorder Name Newton, Jason Affiliation Southeastern Archaeological Research Recorder Contact Information (address / phone / fax / e-mail) 3117 Edgewater Dr., Orlando, FL 32804/754-206-1056/jason.newton@searchinc.cd
 Required Attachments USGS 7.5' MAP WITH STRUCTURE LOCATION CLEARLY INDICATED LARGE SCALE STREET, PLAT OR PARCEL MAP (available from most property appraiser web sites) PHOTO OF MAIN FACADE, DIGITAL IMAGE FILE When submitting an image, it must be included in digital AND hard copy format (plain paper grayscale acceptable). Digital image must be at least 1600 x 1200 pixels, 24-bit color, jpeg or tiff.

Page 2


8BR04444_a Facing South



8BR04444_b Facing Southeast



8BR04444_c Facing Southwest



8BR04444_d Facing Northeast





APPENDIX B:

FDHR SURVEY LOG SHEET

Ent D (FMSF only)



Survey Log Sheet Survey # (FMSF only)

Florida Master Site File Version 5.0 3/19

Consult *Guide to the Survey Log Sheet* for detailed instructions.

Manuscript Information Survey Project (name and project phase) Cultural Resources Assessment Survey for the Roberts Road North Expansion Area and NASA Parkway Connector at Kennedy Space Center **Report Title** (exactly as on title page) Cultural Resources Assessment Survey for the Roberts Road North Expansion Area and NASA Parkway Connector at Kennedy Space Center, Brevard County, Florida Report Authors (as on title page) 1. Travisano, Mikel 3. Werner, William 2. Newton, Jason 4. Number of Pages in Report (do not include site forms) 52 Publication Year 2022 Publication Information (Give series, number in series, publisher and city. For article or chapter, cite page numbers. Use the style of American Antiquity.) SEARCH, Newberry, Florida (project #R21181) Supervisors of Fieldwork (even if same as author) Names William Werner Affiliation of Fieldworkers: Organization Southeastern Archaeological Research City Orlando, FL Key Words/Phrases (Don't use county name, or common words like *archaeology, structure, survey, architecture, etc.*) 1. _____ 3. ____ 5. ____ 7. ____ 2. 4. _____ 6. 8. Survey Sponsors (corporation, government unit, organization, or person funding fieldwork) Name Kelsey Condell Organization Address/Phone/E-mail Kelsey.Condell@spacex.com Recorder of Log Sheet William Werner Date Log Sheet Completed 5-25-2022 Yes: **P**revious survey #s (FMSF only) Is this survey or project a continuation of a previous project? INO Project Area Mapping **Counties** (select every county in which field survey was done; attach additional sheet if necessary) 1. Brevard 3. _____ 5. ____ 2. 4. 6. USGS 1:24,000 Map Names/Year of Latest Revision (attach additional sheet if necessary) 1. Name ORSINO Year 2021 4. Name Year 2. Name Year Year 5. Name Year 3. Name Year 6. Name Year

Field Dates and Project Area Description						
Fieldwork Dates: Start	End 5-6-2022	Total Area S	urveyed (fill in one) _	73.00 hectares	acres	
Number of Distinct Tracts or Areas Surv	eyed					
If Corridor (fill in one for each) Width:	meters	feet	Length:	kilometers	miles	

Field Dates and Dusiest Aver Description

Page 2	Sur	rvey Log Sheet			Surv	/ey #	
Research and Field Methods							
Types of Survey (select all that apply)	: ⊠archaeological □damage assessment	⊠architectural □monitoring report	historical/a	rchival ibe):	underw	ater	
Scope/Intensity/Procedures	-						
Architectural survey incl mile of the construction footprints and excavation	uded background res footprints. Archaec of shovel tests wh	search and fiel blogical survey mere possible.	d survey to included in	document nspection	struct of the	ures within 1 project	
Preliminary Methods (select as man Florida Archives (Gray Building) Florida Photo Archives (Gray Building) Site File property search Site File survey search other (describe):	y as apply to the project as a library research- <i>local public</i> library-special collection Public Lands Survey (maps at Slocal informant(s)	whole) local proper newspaper DEP) ⊠literature s Sanborn Ins	ty or tax records files earch urance maps	⊠other histor ⊠soils maps ⊠windshield ⊠aerial photo	ric maps or data survey ography	⊠LIDAR □other remote sensing	
Archaeological Methods (select as Check here if NO archaeological met surface collection, controlled surface collection, <u>un</u> controlled Shovel test-1/4"screen shovel test-1/8" screen shovel test 1/16"screen chovel test-unscreened other (describe):	many as apply to the project a hods were used. shovel test-other screen siz water screen posthole tests auger tests coring test excavation (at least 1x	s a whole) seb s n s g (2 m)L	ock excavation (at le oil resistivity agnetometer de scan sonar round penetrating rad DAR	east 2x2 m) Iar (GPR)	☐ meta ☐ other ⊠ pedes ☐ unkno	l detector remote sensing strian survey own	
Historical/Architectural Methods	(select as many as apply to the used.	e project as a whole)					
building permits	demolition permits	□n	eighbor interview		□subdi	vision maps	
□commercial permits □interior documentation □other (describe):	⊠windshield survey ⊠local property records		ccupant interview ccupation permits		⊡tax ro ⊡unkno	ecords own	
		Survey Results					
Resource Significance Evaluated Count of Previously Recorded Resourced Site 104	? 🛛 Yes 🗆 No SOURCES 3 (s with Site File Forms Comm	Count of No	ewly Recorded F	Resources	2		
BR1998, BR2931, BR2932		טיפיופת (מנומכוו מתתווס	ומו µמעפט וו וופניפטט	ai y)			
List Newly Recorded Site ID#s (a	ttach additional pages if neces	sary)					
BR4443, BR4444							

Site Forms Used:

Site File Paper Forms

⊠Site File PDF Forms

REQUIRED: Attach Map of Survey or Project Area Boundary

SHPO USE ONLY	SHPO USE ONLY	SHPO USE ONLY
O rigin of Report: 🛛 872 □Public Lands □UW	□1A32 # Ac	ademic Contract Avocational
Grant Project #	Compliance Review: CRAT #	
Type of Document: Archaeological Survey	torical/Architectural Survey 🛛 Marine Survey 🔲 Cell T	ower CRAS Monitoring Report
Overview Excavation Repo	rt 🛛 Multi-Site Excavation Report 🗖 Structure Detaile	ed Report Library, Hist. or Archival Doc
Desktop Analysis MPS	MRA GG Other:	
Document Destination: Plottable Projects	Plotability:	







TECHNICAL MEMORANDUM ARCHAEOLOGICAL ASSESSMENT FOR THE ROBERTS ROAD NORTH EXPANSION AREA AT KENNEDY SPACE CENTER BREVARD COUNTY, FLORIDA

CONSULTANT:	SEARCH
PROJECT MANAGER:	William Werner, MA
CLIENT:	SpaceX
DATE:	October 2022
SEARCH PROJECT #:	R21181

SEARCH recently completed a cultural resource assessment survey on behalf of SpaceX for the planned expansion of an operations center at the John F. Kennedy Space Center (KSC) on Merritt Island in Brevard County, Florida. The survey results were presented in a previously submitted technical report (SEARCH 2022). The purpose of this memo is to provide a concise summary of SEARCH's background research and field investigation specific to the archaeological APE for the approximately 102-acre Roberts Road North Expansion Area, and to provide additional discussion and supporting evidence for the previously reported findings and recommendations.

Field investigations were initially conducted in October 2021, and a subsequent field visit was conducted in May 2022 when the archaeological APE was updated to include a larger footprint. Prior to the field survey, SEARCH reviewed standard background information to identify zones of archaeological probability. SEARCH concluded that the probability for the APE to contain archaeological sites is low based on the following observations:

- Soil data indicate the APE is entirely poorly or very poorly drained (SEARCH 2022:5).
- Topographic maps and elevation data indicate there are no prominent upland landforms or flowing freshwater within the APE (SEARCH 2022:6-7).
- Historic maps and aerial photographs show no indications of historic activity within the APE (SEARCH 2022:21-26).
- There are no known archaeological sites in the vicinity that share the environmental attributes that characterize the APE (SEARCH 2022:20).

Regarding previous archaeological work in the vicinity, a recent survey of over 500 acres immediately southwest of the APE did not identify any archaeological sites, archaeological occurrences, or other cultural resources (Archaeological Consultants Inc. [ACI] 2019). In contrast to the current APE, this previous survey was conducted within an area that had been historically utilized for agriculture and associated facilities, with drained and filled areas facilitating access to the project site. For a comparison of the current APE with the historically utilized areas to the immediate southwest, see SEARCH (2022:25). Undisturbed portions of the previous survey area, i.e., those areas that are most similar to the current APE, were found to consist of mucky soils or inundated ground surfaces (ACI 2019:5-1)



While the above information indicated the current APE has low archaeological probability, SEARCH recommended fieldwork to verify the environmental conditions and to inspect areas of higher ground. SEARCH used light detection and ranging (LiDAR) data to identify areas of higher ground that could serve as potential access points to navigate around the wetlands (Figure 1). Untraversable areas with water up to 2-3 ft deep were encountered at each of these access points (Figures 2-4). One small, isolated hammock with a stand of oak and palmetto was identified on the east boundary of the APE, and a shovel test was placed at this location. Immediately west of this shovel test was a thicket of palmettos, and hydric vegetation was visible to the west of the palmettos (Figure 5). Attempts were made to access the APE from the north, but these were unsuccessful as the crew consistently encountered inundated terrain.

Figure 6 shows the surface waters and formally delineated wetlands based on recent surveys by environmental scientists with Kimley-Horn and Associates, Inc. and demonstrates that the extend of wetlands is consistent with the findings of SEARCH's analysis. It is possible that there are isolated dry areas within the interior of the APE, but the available evidence suggests these are small, noncontiguous, low-relief, and circumscribed by areas of extensive marsh and wetlands. These conditions would have presented similar obstacles to use or inhabitation in the past, and it is improbable that they would host significant archaeological sites. It is SEARCH's opinion that the survey efforts to date are commensurate with the low probability of finding an archaeological site within the APE, and that further survey efforts would be unlikely to yield a different outcome. The proposed project is unlikely to impact archaeological sites, and no further survey is recommended.

References Cited

Archaeological Consultants, Inc. (ACI)

2019 *Cultural Resource Assessment Survey of the Discovery Solar Energy Center Property, Brevard County, Florida*. Report on file, Division of Historical Resources, Tallahassee, Florida (Manuscript # 26810).

SEARCH

2022 Cultural Resource Assessment Survey of the Roberts North Expansion Area and NASA Parkway Connector at Kennedy Space Center, Brevard County, Florida. On file, SEARCH (Project # R21181).





Figure 1. LiDAR elevation map showing the APE, shovel test location, and photo points at attempted access locations at areas of highest elevation.





Figure 2. View southwest from PP3.



Figure 3. View west from PP4.

Archaeological Assessment of the Roberts Road North Expansion Area at Kennedy Space Center October 2022





Figure 4. View north from PP5.



Figure 5. View west from shovel test.

Archaeological Assessment of the Roberts Road North Expansion Area at Kennedy Space Center October 2022





Figure 6. Surface waters and delineated wetlands within the APE.

Biological Assessment

Biological Assessment

for the

Roberts Road SpaceX Operations Area Expansion

January 2023

TABLE OF CONTENTS

TAE	E OF CONTENTS	I
LIS	OF TABLES	I
LIS	OF FIGURES	II
TAE	E OF ACRONYMS AND ABBREVIATIONS	III
1.	NTRODUCTION	1
2.	PROPOSED ACTION	1
2.	ROBERTS ROAD SPACEX OPERATIONS AREA EXPANSION	2
3.	DESCRIPTION OF THE AREA IMPACTED BY THE PROPOSED ACTION (ACTION ARE	EA)5
3.	LAND COVER	6
4.	SA-LISTED WILDLIFE SPECIES AND CRITICAL HABITAT IN THE ACTION AREA	9
4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 5. 5. 5.	 FLORIDA SCRUB-JAY EASTERN INDIGO SNAKE SOUTHEASTERN BEACH MOUSE MARINE TURTLES WEST INDIAN MANATEE AMERICAN ALLIGATOR WOOD STORK PIPING PLOVER RED KNOT C. EASTERN BLACK RAIL ANALYSIS OF POTENTIAL EFFECTS APPROACH TO ANALYSIS STRESSORS OR THREATS ASSOCIATED WITH PROPOSED ACTION EFEECTS OF ACTION ON LISTED SPECIES	
6.	CONSERVATION MEASURES FOR AFFECTED SPECIES	
6. 6. 6.	GENERAL CONSTRUCTION PRESCRIBED BURNING SPECIES-SPECIFIC MEASURES	24 25 25
7.	SUMMARY OF POTENTIAL EFFECTS AND CONSERVATION MEASURES	
8.	CUMULATIVE IMPACTS	
9.	ITERATURE CITED	

LIST OF TABLES

TABLE 3-1. SUMMARY OF LAND COVER/LAND USE	. 8
TABLE 5-1. POTENTIAL EFFECTS TO ESA-LISTED SPECIES BASED ON STRESSORS/THREATS ASSOCIATED WITH	
THE PROPOSED ACTION	16
TABLE 5-1. COMPENSATION RATIOS FOR DESIGNATED FLORIDA SCRUB-JAY HABITAT AT KSC	19

TABLE 7-1. POTENTIAL IMPACTS, SECTION 7 FINDING, AND CONSERVATION MEASURES FOR FEDERAL AND STA	ATE
PROTECTED WILDLIFE SPECIES THAT OCCUR OR HAVE POTENTIAL TO OCCUR WITHIN THE PROPOSED	
Action Area	27

LIST OF FIGURES

FIGURE 2-1. PROPOSED SITE EXPANSION, NASA PARKWAY CONNECTOR ROAD, AND SECURITY FENCE	2
FIGURE 2-2. EXPANSION AREA CONCEPTUAL SITE PLAN	4
FIGURE 3-1. ACTION AREA AND OPERATIONAL BUFFER	6
FIGURE 3-2. LAND USE, COVER, AND FORMS	7
FIGURE 4-1. DESIGNATED FLORIDA SCRUB-JAY HABITAT	10

TABLE OF ACRONYMS AND ABBREVIATIONS

BA	Biological Assessment
CFA	Core Foraging Area
CFR	Code of Federal Regulations
CNS	Canaveral National Seashore
EO	Executive Order
ESA	Endangered Species Act
EUL	Enhanced Use Lease
FAA	Federal Aviation Administration
FLUCFCS	Florida Land Use, Cover and Forms Classification System
FPL	Florida Power and Light
FWC	Florida Fish and Wildlife Conservation Commission
KSC	John F. Kennedy Space Center
LC	Launch Complex
LCH4	Liquid Methane
MINWR	Merritt Island National Wildlife Refuge
MW	megawatts
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOTMARS	Notice to Mariners
NPC	NASA Parkway Connector
NPR	NASA Procedural Requirement

SFH	Suitable Foraging Habitat
SLC	Space Launch Complex
SpaceX	Space Exploration Technologies
SR	State Route
U.S.	United States
U.S.C.	United States Code
USAF	United States Air Force
USFWS	United States Fish and Wildlife Service

1. INTRODUCTION

A proposed plan is under evaluation for Space Exploration Technologies (SpaceX) improvements and operations at John F. Kennedy Space Center (KSC) in central Florida for the purpose of consolidating its operations in Brevard County, FL into a contiguous campus. SpaceX must enter into and execute a real property agreement with NASA to expand the SpaceX Roberts Road Operations Area. SpaceX currently leases 67 acres from NASA on Roberts Road; the expansion would include up to an additional 100 acres of land north of the existing SpaceX Roberts Road Operations Area for the development of additional office space and facilities in support of vehicle and payload processing, fabrication, storage, manufacturing, and shipping and receiving. SpaceX would also construct/improve an approximately 2.2 miles of roadway that would allow the site to be removed from the KSC secure area. Federal agencies are required to consider environmental consequences resulting from their actions.

NASA's execution of a real property agreement in support of SpaceX's Proposed Action is considered a major federal action under the National Environmental Policy Act (NEPA) of 1969, as amended (42 United States Code [U.S.C.] 4321, et seq.) and requires an environmental review. NASA is the lead federal agency for this environmental review, and it was prepared pursuant to the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 Code of Federal Regulations [CFR] parts 1500-1508), National Aeronautics and Space Administration (NASA) regulations for implementing NEPA (14 CFR Subpart 1216.3), and the NASA Procedural Requirement (NPR) for Implementing NEPA and Executive Order (EO) 12114 (NPR 8580.1).

In accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.), this Biological Assessment (BA) has been prepared to analyze the potential effects of the expansion of the SpaceX Roberts Road Operations Area on ESA-listed species and designated critical habitat under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS). This BA is intended to support formal consultation between the NASA and USFWS as required by ESA Section 7 and 50 CFR § 402.14(c). This BA also supports informal consultation regarding species that may be affected but are not likely to be adversely affected by the NASA's Proposed Action.

2. PROPOSED ACTION

Under the Proposed Action, SpaceX would expand the SpaceX Roberts Road Operations Area to the north. SpaceX would also construct a new connector road a new connector road along an existing dirt service road, however, there is a small section that would be constructed on new location. The new connector road would be constructed from the site to NASA Parkway. The Proposed Action also includes construction of security fencing around the site and FPL Discovery Solar Center (solar farm) as shown in Figure 2-1.



Figure 2-1. Proposed Site Expansion, NASA Parkway Connector Road, and Security Fence

2.1. Roberts Road SpaceX Operations Area Expansion

Under the Proposed Action, SpaceX would acquire up to 100 acres of land north of the existing Roberts Road SpaceX Operations Area for the development of additional office space and facilities in support of vehicle and payload processing, fabrication, storage, manufacturing, and shipping and receiving—see proposed site layout in **Error! Reference source not found.** ("Expansion Area"). As shown in **Error! Reference source not found.**, SpaceX would construct facilities and a new parking area to support these uses. The total footprint of the facilities within the Expansion Area would not exceed 1.5 million square feet, and facility height would not exceed approximately 400 feet. Internal site roads would provide access and connectivity to facilities within the site boundary. Given the proximity of the proposed facilities to the Launch and Landing Facility and the Cape Canaveral Space Force Station (CCSFS) Skid Strip, SpaceX would conduct an airspace analysis in accordance with 14 CFR Part 77. SpaceX would also file and comply with Federal Aviation Administration (FAA) Form 7460-1, Notice of Proposed Construction or Alteration.

As the site develops, employees and operations would begin to consolidate at the Roberts Road SpaceX Operations Area where the the majority of employees would primarily be located. SpaceX is planning to cease operations at Hangar AO on CCSFS in 2023. At this time, other

SpaceX facilities at KSC and CCSFS would be retained. Construction of the site would last for approximately two to three years and the site would be occupied for the foreseeable future upon completion.

Under the Proposed Action, SpaceX would expand fiber communications connectivity, water, and wastewater utilities to the new facilities from the existing Roberts Road SpaceX Operations Area. FPL would provide power via new underground feeders that would run from FPL's planned Saturn Substation,¹ south along Kennedy Parkway, west along Schwartz Road, and south along Avenue A. SpaceX expects to need an additional 10-megawatt service to the site to supplement the 10-megawatt service already in place.

Pending NASA's feasibility determination and approval, NASA would modify the KSC secure area and allow for the construction of NASA KSC security fence such that the SpaceX Roberts Road Operations Area, Expansion Area, and FPL solar farm would be outside the existing KSC security fence. SpaceX would construct a new security fence around the FPL solar farm and expanded SpaceX Roberts Road Operations Area to separate these areas from the KSC secure area (see **Error! Reference source not found.**). The new security fence would be constructed in accordance with NPR 1620.3, Physical Security Requirements for NASA Facilities and Property. The new security fence would include a new gate on A Avenue into the SpaceX Roberts Road Operations Area for hardware transport that would remain closed under nominal circumstances. The construction of the NASA KSC security fence would not require the relocation of the KSC Security Checkpoint on NASA Parkway.

¹ The FPL Saturn substation has been permitted and construction is anticipated to begin in 2023.



Figure 2-2. Expansion Area Conceptual Site Plan

2.2. Connector Road

Under the Proposed Action, SpaceX would construct an approximately 2.2-mile connector road primarily along an existing dirt road from NASA Parkway to Roberts Road (the "NASA Parkway Connector") (see Figure 2-1 for the notional alignment). The proposed road would vary in width, and generally include two lanes. Around the existing SpaceX Roberts Road Operations Area, a third lane would be added to match the existing Roberts Road design. The proposed NASA Parkway Connector would generally follow the existing unpaved Roberts Road and access road adjacent to the FPL solar farm before connecting, on new location, with NASA Parkway at the signalized intersection with Space Commerce Way. The new leg at the intersection of NASA Parkway and Space Commerce Way would require traffic signal modifications to accommodate the additional signal phases. SpaceX would locate any necessary utilities within the width of the proposed NASA Parkway Connector right-of-way. The ultimate roadway corridor width would vary based on topography and drainage requirements, and would be determined during final design. This conservative corridor is approximately 72 acres and includes NASA Parkway in the immediate vicinity of the proposed intersection. The total land acquired through the EUL would be less than this; ultimate acreages would be determined as design of the roadway progresses. For the purpose of this BA, a 200-foot-wide roadway corridor was evaluated. The Proposed Action includes minor intersection improvements (e.g., turn lanes) on NASA Parkway to accommodate the addition of the proposed NASA Parkway Connector and maintain an acceptable level of operation. Construction of this road is anticipated to take two years.

SpaceX would construct a gate along the proposed road near the FPL solar farm to secure the facility and only allow approved personnel. Additional gates would be constructed along A Avenue and Roberts Road to prevent unauthorized access from the SpaceX Operations Area to KSC. The remainder of the road outside of the SpaceX gate would be publicly accessible.

When fully operational, SpaceX expects up to approximately 5,200 vehicle trips per day to and from the SpaceX Roberts Road Operations Area. The vehicle trips per day are anticipated to be comprised of employees, customers, and contractors traveling to and from the site and trucks delivering materials in support of manufacturing and production activities. The proposed NASA Parkway Connector would redirect this SpaceX-related traffic away from the KSC Security Checkpoints. This redirection of traffic would reduce the number of badges required for processing by KSC, which would reduce strain on KSC staff. The Proposed Action would also reduce vehicle miles traveled within the KSC internal road network, reducing overall wear on the roads.

3. DESCRIPTION OF THE AREA IMPACTED BY THE PROPOSED ACTION (ACTION AREA)

In October 2021, January and May 2022, a pedestrian survey was completed of the area impacted by the Proposed Action (action area) to map vegetation communities, determine the presence of jurisdictional wetlands and surface waters, and document the presence/absence of habitat that could support, listed wildlife species. The action area (the area directly impacted by the Proposed Action and a one-mile operational buffer) is included in Figure 3-1.



Figure 3-1. Action Area and Operational Buffer

3.1. Land Cover

The land cover within the action area that would be directly impacted by the Proposed Action was assigned habitat classifications per the Florida Land Use, Cover and Forms Classification System (FLUCFCS). It is comprised of fourteen different land use classifications, for a total of 175.8 acres between the expansion area and roadway corridor. A description of each land use type using the three-digit FLUCFCS code is included in Figure 3-1. Table 3-1 includes a detailed description of each land use type and acreage using the four-digit FLUCFCS code.

ROBERTS ROAD SPACEX OPERATIONS AREA EXPANSION AT KENNEDY SPACE CENTER



Figure 3-2. Land Use, Cover, and Forms

FLUCFCS	FLUCFCS	Description		
Code	Туре	Description		
224	Abandoned Tree Crops	This category includes abandoned fields previously used for agriculture.		
310	Herbaceous (Dry Prairie)	This category includes upland prairie grasses which occur on non- hydric soils but may be occasionally inundated by water. They are generally treeless with a variety of vegetation types dominated by grasses, sedges, rushes, and other herbs including wire grasses with some saw palmetto (<i>Serenoa repens</i>) present.	1.3	
320	Shrub and Brushland	This category includes areas dominated by low shrubs such as saw palmetto, gallberry (<i>Ilex glabra</i>), dahoon holly (<i>Ilex cassine</i>), wax myrtle (<i>Morella cerifera</i>) and saltbush (<i>Baccharis halimifolia</i>). Some scrub oaks such as sand live oak (<i>Quercus geminata</i>), Chapman oak (<i>Quercus chapmanni</i>), or myrtle oak (<i>Quercus myrtifolia</i>) were also observed in limited quantities. Along the roadways these areas were also dominated by Brazilian pepper (<i>Schinus terebinthifolia</i>).	21.4	
420	Upland Hardwood Forest	This category includes live oak (<i>Quercus virginiana</i>), saw palmetto, and fetterbush (<i>Lyonia lucida</i>).	4.2	
425	Temperate Hardwood	This category includes a variety of oaks, red bay (<i>Persea borbonia</i>), sweetbay magnolia (<i>Magnolia virginiana</i>), sweetgum (<i>Liquidambar</i> <i>styraciflua</i>), sugarberry (<i>Celtis laevigata</i>), hickories (<i>Carya</i> spp.), cabbage palm (<i>Sabal palmetto</i>), hollies (<i>Ilex</i> spp.), and eastern red cedar (<i>Juniperus virginiana</i>).	5.6	
434	Hardwood- Conifer Mixed	This category includes areas dominated by slash pine (Pinus elliotti), eastern red cedar (<i>Juniperus virginiana</i>), Chapman oak, live oak, cabbage palm (<i>Sabal palmetto</i>), saltbush, and wax myrtle.	11.5	
437	Australian Pine	This category is dominated by Australian pine (<i>Casuarina</i> equisetifolia) trees.	0.3	
510	Streams and Waterways	This category includes the roadside and railway side ditches excavated within wetlands. These features are linear in nature. Vegetation includes Carolina willow (<i>Salix caroliniana</i>), Peruvian primrose willow (<i>Ludwigia peruviana</i>), duck potato (<i>Sagittaria lancifolia</i>), cattail (<i>Typha</i> spp.), water fern (<i>Azolla filiculoides</i>), Brazilian pepper (<i>Schinus terebinthifolia</i>), torpedograss (<i>Panicum repens</i>), and duckweed (<i>Lemna minor</i>).	12.2	
530	Reservoirs	Reservoirs are artificial impoundments of water.	<0.1	
617	Mixed Wetland Hardwoods	This category is dominated by red maple (<i>Acer rubrum</i>), American elm (<i>Ulmus americana</i>), cabbage palm, Brazilian pepper, swamp dogwood (<i>Cornus foemina</i>), fetterbush, royal fern (<i>Osmunda regalis</i>), arrowhead (<i>Sagittaria</i> spp.), and sawgrass (<i>Cladium jamaicense</i>).	71.3	
618	Cabbage Palm Hammock	This category includes cabbage palms in hydric soils.	4.4	
640	Vegetated Non- Forested Wetlands	This category includes cattails, pickerelweed (<i>Pontederia cordata</i>), white-top sedge (<i>Rhynchospora colorata</i>), flastsedge (<i>Cyperus odoratus</i>), and rushes (<i>Juncus spp.</i>).	1.7	
641	Freshwater Marshes	This category includes the interior freshwater marshes found throughout the study area. Vegetation was varied but generally consisted of needlerush (<i>Juncus roemerianus</i>), sand cordgrass (<i>Spartina bakeri</i>), smooth cordgrass (<i>Spartina alterniflora</i>), cattail, and giant leather fern (<i>Acrostichum danaeifolium</i>).	16.4	
646	Mixed Scrub- Shrub Wetland	This category includes the seasonally inundated wetlands in which species such as Brazilian pepper, saw palmetto, gallberry, dahoon holly, wax myrtle, saltbush, wild coffee (<i>Psychotria nervosa</i>), and the occasional Chapman oak grow. Additional species scattered throughout also included winged sumac (<i>Rhus copallinum</i>), swamp fern (<i>Blechnum serrulatum</i>), and St. John's wort (<i>Hypericum</i> spp.).	6.8	

Table 3-1. Summary of Land Cover/Land Use

FLUCFCS Code	FLUCFCS Type	Description	Acres
814	Roads and Highways	This category includes the roadway which runs east to west and connects to the existing Roberts Road as well as NASA Parkway.	13.5
		Total	175.8

4. ESA-LISTED WILDLIFE SPECIES AND CRITICAL HABITAT IN THE ACTION AREA

4.1. Florida Scrub-Jay

The Florida scrub-jay (*Aphelocoma coerulescens*) is a federally threatened bird similar to the common blue jay in size and shape, with a pale blue crestless head, nape, wings, and tail. Optimal scrub-jay habitat consists of low growing, scattered scrub species with patches of bare sandy soil such as those found in sand pine scrub and scrubby flatwoods habitats that are occasionally burned. In areas where these types of habitats are unavailable, Florida scrub-jays may be found in less optimal habitats such as pine flatwoods with scattered oaks.

KSC hosts one of the four largest remaining populations of the Florida scrub-jay, with an estimated potential population size of 700 breeding pairs. Current population levels are approximately half of that due to habitat degradation. Monitoring of color-banded scrub-jay populations at KSC began in 1987 and found territory sizes averaged 25 acres (NASA 2020a).

Three types of habitat have been defined to categorize the importance and roles of different landscapes for maintaining populations of Florida scrub-jay. Core areas are described as primary habitat (oak scrub on well drained soils) and adjacent secondary habitat (large oak scrub ridges on poorly drained soils) that provide for large, contiguous clusters of territories. Support areas are smaller clusters of primary and secondary habitats outside of important fire management units. These may enhance population size and provide connectivity between population cores. Auxiliary habitats are mostly flatwoods with small scrub oak patches generally outside of fire management units. Auxiliary habitats are population sinks where mortality usually exceeds recruitment, but are considered to have the potential to become core or support habitats with sufficient management. Auxiliary habitat is lower quality regardless of management history. These areas comprise the major scrub-jay population areas. Scrub-jay habitat types and locations within the action area are shown in Figure 4-1. There is no critical habitat for this species in the action area.



Figure 4-1. Designated Florida Scrub-Jay Habitat

4.2. Eastern Indigo Snake

The eastern indigo snake (*Drymarchon corais couperi*) is listed as threatened by USFWS and occurs in a range of habitats, including pine flatwoods, scrubby flatwoods, high pine, dry prairie, tropical hardwood hammocks, edges of freshwater marshes, agricultural fields, coastal dunes, and human-altered habitats. Eastern indigo snakes are often found in strong association with gopher tortoises, though this is more prevalent where temperatures drop to below 50 degrees regularly in the winter. They are also known to use the burrows of armadillos, cotton rats, and land crabs (in coastal areas). These snakes require large tracts of land for survival and are typically restricted to xeric habitats on pine-oak sandhills. Indigo snakes forage in hydric habitats, often along wetland ecotones. Gopher tortoise burrows provide this species with shelter from cold winter temperatures and relief from desiccation (South Florida Multi-Species Recovery Plan, USFWS 1999).

Eastern indigo snake radio-tracking first took place on KSC between 1990 and 1992, and a small number were tagged to determine home range size and habitat use. Data collected from 1998 to 2002 found home range sizes were variable, with males generally using a larger area than females. The study found that eastern indigo snakes used a wide variety of habitats (Breininger et al 2011). Suitable habitats, such as native uplands and hydric habitats were documented within the action area; however, no indigo snakes were observed during field reconnaissance. There is no critical habitat for this species in the action area.

4.3. Southeastern Beach Mouse

The southeastern beach mouse (*Peromyscus polionotus niveiventris*) is a federally threatened subspecies that is one of sixteen subspecies of the small old-field mouse and one of seven subspecies identified as beach mice. Historically, this species could be found on Florida's east coast from Ponce Inlet, Volusia County to Hollywood in Broward County. Current distribution is believed to be limited to approximately 50 miles of dune habitat in Volusia and Brevard Counties and within pockets of suitable habitat in Indian River and St. Lucie Counties. This species is a high priority for management on federal lands encompassing the Cape Canaveral Barrier Island Complex, which includes KSC/MINWR, CCSFS, and Canaveral National Seashore (CNS). This species is geographically isolated from all other subspecies of beach mice. Declines in this species can be attributed to severe fragmentation and destruction of its coastal habitat and as such the beach mouse has been extirpated from Fort Pierce Inlet, St. Lucie County south through Broward County. There is no designated critical habitat for this species. Dune vegetation, particularly sea oats (*Uniola paniculata*) within the primary coastal dune, is considered essential habitat (Hipes et al. 2000). Habitat for this species was not observed within the action area and no beach mice were observed during field reconnaissance.

4.4. Marine Turtles

The Atlantic loggerhead sea turtle, Atlantic green sea turtle, and the leatherback sea turtle are found along KSC beaches. Research indicates that lights adjacent to sea turtle nesting beaches may hinder the beach nest site selection of nesting females (Witherington et al. 2014). 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. As hatchlings head toward artificial lights, their exposure to predators and the likelihood of dehydration are greatly increased. Misoriented hatchlings can become entrapped in vegetation or debris, and some hatchlings have been found dead on nearby roadways and in parking lots after being struck by vehicles. Intense artificial lighting can even draw hatchlings back out of the surf (USAF 2018).

Critical habitat for the loggerhead sea turtle includes the KSC shorelines and waterways. There is no critical habitat for the remaining marine turtle species at KSC. Although there is habitat for sea turtle species within MINWR and CNS along the beaches, no habitat for these species were observed within the action area. Species descriptions are provided below.

4.4.1. GREEN SEA TURTLE

The green sea turtle (*Chelonia mydas*) is listed as endangered by USFWS and FWC. Green sea turtles grow up to 3.2 feet in size and can weigh up to 400 pounds. They have a black carapace and a white plastron and differ from other sea turtles by having a smooth carapace with four pairs of lateral (costal) scutes and a solitary pair of prefrontal scales between their eyes. Their diet commonly consists of algae and seagrass. In the Atlantic, these turtles are found from the U.S. Virgin Islands, Puerto Rico, and between Texas and Massachusetts in the U.S, with important feeding areas found in the Indian River Lagoon, Florida Keys, Florida Bay,

Homosassa, Crystal River, and Cedar Key. Additionally, large numbers of nests (clutches) have been documented in Florida Counties such as Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward (NMFS and USFWS 1991).

4.4.2. HAWKSBILL SEA TURTLE

The hawksbill sea turtle (*Eretmochelys imbricate*) is listed as endangered by USFWS and FWC. Hawksbills are small to medium sized (35-inch carapace length) sea turtles with an irregularly patterned, brown, carapace (upper shell) that is sharply serrated and somewhat heart shaped. They have a white to yellow plastron (lower shell) and the upper jaw is narrowly pointed as a beak, giving the turtle its name. They can also be distinguished as having two pairs of prefrontal scales between their eyes, four pairs of lateral (costal) scutes, one cervical (nuchal) scute, and two claws on each flipper. Hawksbills inhabit marine coastal and oceanic waters, and are commonly associated with coral reefs, keys, and mangroves. While inhabiting these areas, their diet consists primarily of sponges. These sea turtles nest on sandy beaches and nesting in Florida is largely restricted to the southeastern coast between Volusia and Dade Counties, and Monroe County (NMFS and USFWS 1993).

4.4.3. KEMP'S RIDLEY SEA TURTLE

The Kemp's Ridley sea turtle (*Lepidochelys kempii*) is listed as endangered by USFWS and FWC and is the smallest and most endangered species of sea turtle in the world. This species can grow to a length of 2 to 2.5 feet and usually weighs between 85 and 100 pounds. The carapace (upper shell) is olive-gray in color and circular in shape. They have beak that resembles a parrot's beak and a large head. These turtles typically have 12 pairs of marginal scutes, five lateral (costal) scutes, five vertebral scutes, and one cervical (nuchal) scute. The diet of Kemp's Ridley sea turtle primarily consists of crabs and other crustaceans.

Kemp's Ridley sea turtles mainly inhabit marine waters of the Gulf of Mexico. Nesting for this species occurs between April and July along the sandy beaches of Rancho Nuevo, Mexico; however, they can be found on Texas and Florida beaches as well, though infrequent.

4.4.4. LEATHERBACK SEA TURTLE

The leatherback sea turtle (*Dermochelys coriacea*) is listed as endangered by USFWS and FWC. Leatherback sea turtles differ from other sea turtle in that their shells are comprised of a thick layer of fatty tissue that is overlapped with tiny bones and covered with a thin layer of black skin. Their bodies are also black with blue, pink, and white splotches throughout. Leatherbacks are large, averaging six feet in length and weighing between 500 and 1,500 pounds, making them the largest sea turtle in the world. Leatherback sea turtles' diet is comprised almost exclusively of jellyfish and salps (NMFS and USFWS 1992).

Leatherbacks inhabit marine waters throughout the Atlantic, Pacific, and Indian Oceans and nest on sandy beaches within these oceans. Nesting in the United States usually occurs at night in Florida, Puerto Rico, and St. Croix (U.S. Virgin Islands) from late February to as late as August, with a peak in May (NMFS and USFWS 1992).

4.4.5. LOGGERHEAD SEA TURTLE

The loggerhead sea turtle (*Caretta caretta*) is a medium to large species with a large head. Adults range in size from 2.4 to 3.5 feet and weigh between 155 to 412 pounds. Their head scales, dorsal flipper scales and carapace (upper shell) are reddish-brown, while their plastron (lower shell) is light yellow. The jaws of the loggerhead are very powerful, which enables them to easily crush their armored prey. Loggerhead sea turtles have 11 to 12 marginal scutes, five lateral (costal) scutes, five vertebral scutes, and one cervical (nuchal) scute (NMFS and USFWS 2008).

Like leatherback sea turtles, a considerable portion of the loggerhead diet is comprised of jellyfish, though they also consume crabs, pelagic snails, barnacles, and other organisms. Loggerhead sea turtles inhabit the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans and nest on beaches from Texas to Virginia within the continental United States. Nesting concentrations occur on the coastal islands of North Carolina, South Carolina, and Georgia, and on the Atlantic and Gulf coasts of Florida, with approximately 80 percent of the nesting activity occurring in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward counties (NMFS and USFWS 2008).

4.5. West Indian Manatee

The West Indian manatee (*Trichechus manatus*) is listed as threatened by USFWS and is a large, gray, nearly hairless, aquatic mammal that has a round, paddle-shaped tail. Adult manatees typically average 9 feet in length, weigh around 900-1000 pounds, and inhabit coastal waters, bays, rivers, and occasionally lakes. Manatees range from the southeastern United States to Central America and require warm-water refugia such as springs or cooling effluent during cold weather. Manatees are herbivorous and commonly feed on seagrass species, which was not observed within the action area. The wetlands and surface water systems located within the action area were determined to be freshwater systems that are not directly connected to the Indian River Lagoon to the northwest. Therefore, there is no habitat for the West Indian manatee within the action area and no individuals were observed during field reconnaissance. While there is critical habitat for the West Indian manatee at KSC, there is no critical habitat for this species in the action area.

4.6. American Alligator

The American alligator (*Alligator mississippiensis*) is listed as threatened by the USFWS and FWC due to its similarity of appearance to the more endangered crocodilians. The range of the American alligator extends from east Texas and southeast Oklahoma, throughout Florida and north to North Carolina. Alligators typically inhabit freshwater lakes, wetlands and slow-moving rivers, but are sometimes found in brackish water habitats. Juvenile alligators primarily consume insects, amphibians, small fish, and other invertebrates. Adult alligators eat rough fish, snakes, turtles, small mammals, and birds. No alligators were observed during field investigations, but may be present due to the suitable habitat observed throughout the action area. The project area is outside the known range of the American crocodile. There is no critical habitat for this species in the action area.

4.7. Wood Stork

The wood stork (*Mycteria americana*) is listed as threatened by the USFWS and is typically found in marshes, cypress swamps, and mangrove swamps, but their presence in artificial ponds, seasonally flooded roadside or agricultural ditches, and managed impoundments has become common. Wood stork breeding areas extend from South Florida through Georgia and along the coastal areas of South Carolina. Large, colonial nesting areas are typically established in swamps or islands surrounded by broad, open water areas. The same colony site may be used over many years, provided the site remains undisturbed and sufficient foraging habitat is available. Wood storks are known to nest with other wading bird species, including white ibis, tricolored herons, snowy egrets, and great blue herons. Foraging habitat consists of nearly any calm, shallow water area (between 10 and 25 centimeters) wetland depression that concentrates fish and is not overgrown with dense, aquatic vegetation. Some examples of foraging sites include freshwater marshes, stocked ponds, shallow ditches, narrow tidal creeks, shallow tidal pools, and depressional areas of cypress heads and swamp sloughs provide foraging habitat. The action area is within the Core Foraging Area (CFA) of a wood stork colony. No Suitable Foraging Habitat (SFH) for this species is present within the SpaceX Roberts Road Operations Expansion Area. SFH is present within proposed NPC area. There is no critical habitat for this species in the action area.

Only one wood stork nest has been recorded on KSC since 1991; it occurred in 2008 on a mixed wading bird colony on a spoil island in the Indian River, north of the Black Point Wildlife Drive on MINWR. Small numbers of wood storks are seen regularly during monthly wading bird foraging habitat use surveys in salt marshes on KSC. They are more regularly observed foraging in or along the edges of freshwater roadside ditches in winter (NASA 2020a). No wood storks were observed during field reconnaissance.

4.8. Piping Plover

The piping plover (*Charadrius melodus*) is listed as threatened by USFWS and is a small shorebird (approximately 7 inches) that has a black bill, yellow-orange legs, and white to gray plumage on its belly and lower body. Breeding piping plovers display a black band across the forehead and a dark ring partly around neck. These markings fade in winter birds and are not present in juveniles. Piping plovers feed on insects, crustaceans, and marine worms. In Florida, piping plovers overwinter along the Atlantic and Gulf coasts and usually are encountered in winter plumage. Piping plovers inhabit sandy beaches, sand flats, and mudflats and are much more common on the Gulf coast. The Atlantic coast birds are fewer in number and are scattered from Duval County south to Brevard, St. Lucie, and Miami-Dade Counties. Piping plovers are primarily associated with barrier island beaches. Piping plovers have been observed at coastal inlets and on low-lying barrier islands with overwash intertidal flats. Habitat for this species was not observed within the action area and no individuals were observed during field reconnaissance. There is no critical habitat for this species in the action area.

4.9. Red Knot

The red knot (*Calidris canutus*) is listed as threatened by USFWS and is a shorter bird with a chunky appearance. In winter plumage the bird is nondescript, while in breeding plumage, this

bird has a robin-red colored chest. Red knots breed in the Canadian Arctic and migrate to as far south as southern Argentina. These birds either use Florida as a stopover during their migration or as wintering grounds. Preferred habitats in Florida include sandy, open beaches, and tidal mudflats. The red knot has been documented within MINWR, specifically at Black Point Drive, both during migration and during the winter (Niles et al. 2008). Habitat loss and degradation and decreased abundance of horseshoe crab eggs have contributed to the decline in numbers of the red knot. Horseshoe crabs are a common bait used in commercial crab industries, which has caused a decline in numbers of the crabs, especially in Cape May peninsula and Delaware Bay. Habitat for this species was not observed within the action area and no individuals were observed during field reconnaissance. There is no critical habitat for this species in the action area.

4.10. Eastern Black Rail

The eastern black rail (*Laterallus jamaicensis jamaicensis*) is listed as threatened by the USFWS and is a small, secretive bird with dark gray to blackish back and upper tail feathers. Overall, males are darker and have pale to medium gray throats, while females are lighter and have pale gray to white throats. Throughout the United States, the eastern black rail can be found in a wide variety of habitats, including tidally or non-tidally influenced, salt to fresh marshes and upland areas within marshes. Within the southern Atlantic coast, black rails are typically found within impounded and unimpounded salt and brackish marshes. Their bills allow for feeding on small aquatic and terrestrial invertebrates and small seeds. Habitat for the eastern black rail can be found within the action area; however, no individuals were observed during field reconnaissance. There is no critical habitat for this species in the action area.

5. ANALYSIS OF POTENTIAL EFFECTS

5.1. Approach to Analysis

This section presents an analysis of potential effects on ESA-listed species from the Proposed Action. Activities that may affect ESA-listed species include habitat loss, construction, daily operations at the SpaceX Roberts Road Operations Area, and roadway traffic along the NPC. No critical habitat is present within the action area.

Effects of the action are all consequences on listed species or critical habitat that are caused by the Proposed Action, including the consequences of other activities that are caused by the Proposed Action (50 CFR § 402.02). Direct effects are the direct or immediate effects of the project on the species or its habitat. Indirect effects are those that are caused by the Proposed Action and are later in time, but still are reasonably certain to occur (e.g., attraction of predators due to development and human presence). All direct and indirect project effects on listed species in this BA have been further classified and evaluated based on their anticipated longevity (i.e., temporary or permanent effects). A consequence is caused by the Proposed Action if it would not occur but for the Proposed Action and it is reasonably certain to occur (50 CFR § 402.17). Under the Proposed Action, there are no other activities that would cause consequences to listed species or critical habitat.

As they relate to the ESA-listed species considered in this BA, direct and indirect effects from proposed activities within the action area have been evaluated herein based upon: (1) an understanding of the methods and equipment that would be used during construction and
operation of the Proposed Action, (2) knowledge of the potential for such methods and equipment to disturb the natural resources on which the subject species depend, and (3) awareness of the types of effects that have resulted from similar actions in the past.

Table 5-1. Potential Effects to ESA-Listed Species Based on Stressors/	Threats
Associated with the Proposed Action	

Stressor or Threat	Potential Effect on Species	Species Potentially	
		Affected	
Construction	Construction noise could result in a startle response to species or cause species to avoid the area around the construction site. Fugitive dust emissions and stormwater runoff could result in impacts to species health adjacent to the construction site. Best management practices would be implemented to reduce or avoid potential impacts on species due to construction.	 Florida scrub-jay Gopher tortoise Eastern indigo snake American alligator Wood stork Eastern black rail 	
Roadway Traffic	An increase in vehicle traffic during daily operations from construction and SpaceX operations personnel could potentially increase the likelihood of wildlife being killed by a collision with a vehicle. In addition, increased traffic and human presence could cause wildlife to avoid the area.	 Florida scrub-jay Gopher tortoise Eastern indigo snake American alligator Wood stork Eastern black rail 	
Night Lighting	Lighting on beaches or inland may disrupt nesting and hatchling emergence from sea turtle nests. Hatchlings that crawl toward artificial light sources are following the same instinctive response that leads them seaward. This effect may result in harassment or harm to sea turtle species. Inappropriate lighting may also result in abandonment of nesting and roosting areas by terrestrial birds. Inappropriate lighting would not be expected to result in adverse effects to mammal species.	 All sea turtles Florida scrub-jay Wood Stork	
Tall Structures	The construction of new structures could pose a potential collision impact to birds. Lighting associated with tall structures also could contribute to sky glow, disorienting sea turtles.	Florida scrub-jayWood storkEastern black railAll sea turtles	
Hazardous Materials	During construction and operations, there is the potential for spills of hazardous materials. The likelihood that an ESA-listed species would come into contact of a hazardous material during a spill is low given SpaceX's immediate clean-up response.	 Florida scrub-jay Gopher tortoise Eastern indigo snake American alligator Wood stork Eastern black rail 	
Habitat Loss	Direct and indirect loss of habitat with the indirect effect from the potential increase in exotic species from construction activities and restriction on prescribed burning has the potential to reduce native species ability to reproduce, find food, find shelter, and survive.	 Florida scrub-jay Gopher tortoise Eastern indigo snake American alligator Wood stork Eastern black rail 	

5.2. Stressors or Threats Associated with Proposed Action

5.2.1. CONSTRUCTION

Construction of the Proposed Action would result in short-term impacts due to noise, fugitive dust, and potential runoff into adjacent habitat. Potential impacts from construction associated with hazardous materials and habitat loss are described in Sections 5.2.5 and 5.2.6, respectively. Construction noise could cause a startle response in species or cause species to avoid the area

near the construction site. Fugitive dust could negatively impact species health due to reduced air quality. Stormwater runoff during construction could negatively impact adjacent habitat. Best management practices would be implemented during construction to control both fugitive dust emissions and stormwater runoff to reduce or avoid potential impacts.

5.2.2. ROADWAY TRAFFIC

An increase in vehicle traffic during daily operations from construction and SpaceX operations personnel would increase the potential for vehicle collisions with wildlife, including ESA-listed species. Increased traffic and human presence could cause wildlife to avoid the area. Additionally, the construction of the NPC would result in a new roadway that could increase the likelihood of inadvertent collisions between wildlife and vehicles. Most of the traffic from construction and operations would occur during daylight hours. Drivers would be expected to obey the posted speed limit and the potential for wildlife collision would be similar to other areas of KSC.

5.2.3. NIGHT LIGHTING

Night lighting represents a potential stressor to nesting sea turtles on nearby beaches as well as migrating birds and nocturnal species. Lighting (e.g., sky glow) at night can disorient or interrupt the nesting process of sea turtles, which nest nocturnally. Sky glow from nighttime lighting at the SpaceX Roberts Road Operations Area could cause emerging hatchlings to crawl in the wrong direction (i.e., away from the ocean). Hatchlings whose sea-finding is disrupted by unnatural stimuli often die from exhaustion, dehydration, predation, or other causes (Witherington et al. 2014).

Lighting management plans would be prepared in accordance with the KSC exterior lighting requirements described in KNPR 8500.1, Revision E, the Biological Opinion (BO) (FWS Log No. 04EF1000-2016-F-083) on artificial lighting at KSC, and KSC-PLN-1210, Rev A. Conservation measures included in this BO include the following:

- Using special long-wavelength lighting with exceptions where color rendition is an operational or safety requirement;
- Using only the minimum lighting required for safety and security;
- Keeping light fixture mounting heights as low as possible while shielded from direct view of the beach; and
- Developing facility specific Lighting Operations Manuals to ensure only authorized use of lighting for all new construction and facility upgrades.

Upon completion of the proposed expansion, SpaceX would submit a Lighting Operation Manual for the Roberts Road SpaceX Operations Area and would maintain compliance with the approved lighting operation plan. Pursuant to the KSC marine turtles BO, KSC would conduct nighttime surveys of proposed facilities during sea turtle nesting season to ensure compliance with the approved lighting operation plan.

5.2.4. TALL STRUCTURES

The construction of new structures could pose a potential collision impact to birds. According to the USFWS, collision hazards for birds depend on several factors related to the bird,

infrastructure, and location. Research indicates that collision mortality increases with structure height for most structures (e.g., communication towers and wind turbines) (USFWS 2020). During the daytime, birds collide with windows because they see reflections of the landscape in the glass (e.g., clouds, sky, vegetation, or the ground); or they see through glass to perceived habitat (including potted plants or vegetation inside buildings) or to the sky on the other side (USFWS 2016). At night, during spring and fall bird migrations when inclement weather occurs, birds can be attracted to lighted structures resulting in collisions, entrapment, excess energy expenditure, and exhaustion (Manville 2009). The Proposed Action involves the construction of two facilities that are not to exceed 400 feet in height. These structures include glass windows that would be tinted. Potential effects from lighting would be reduced by complying with established lighting policy for minimizing disorienting effects on wildlife.

5.2.5. HAZARDOUS MATERIALS

Hazardous materials have the potential to impact the ESA-listed species in the action area. The likelihood that an ESA-listed species would come into contact with a hazardous material during a spill during construction and operations is low given SpaceX's immediate clean-up response.

Most of the hazardous materials expected to be used are common and include diesel fuel, gasoline, and propane to fuel equipment; hydraulic fluids, oils, and lubricants; welding gases; paints; solvents; adhesives; and batteries. An accidental release of hazardous materials during construction (e.g., equipment fuel spill) could affect individual ESA-listed species if they were exposed to the contaminant, which could cause injury, sickness, or death. Accidental spills could also affect vegetated habitat by damaging or killing plants, which could affect plant density and diversity. SpaceX personnel and associated contractors would be required to comply with appropriate hazardous materials handling and management procedures. The likelihood of a potential release of hazardous materials during construction would be low and would affect a limited area, and SpaceX's immediate clean-up response would avoid or minimize effects on species and habitat.

Hazardous materials would be stored in their original containers with their original product labels and would not be stored directly on the ground. These materials would be stored on pallets under cover and with secondary containment. Incompatible materials would not be stored together, and sufficient space would be provided between stored containers to allow for spill cleanup and emergency response access. Storage units would meet building and fire code requirements and would be located away from vehicle traffic. Storage instructions would be posted, and construction employees would be trained in proper receiving, handling, and storage procedures. Safety Data Sheets for all hazardous materials stored would be provided and available to all site personnel.

5.2.6. HABITAT LOSS

Expansion of the Roberts Road SpaceX Operations Area and the NPC would result in the direct removal of habitat for the Florida scrub-jay, eastern indigo snake, American alligator, wood stork and eastern black rail. Indirect impacts to habitat can result from the potential import of exotic species seed source adjacent to the construction area or reduction in prescribed burning due

to critical hardware restrictions and therefore have the potential to make the adjacent habitat less suitable for native protected species.

The Kennedy Space Center Florida-Scrub Jay Compensation Plan (NASA 2014) and USFWS BO (FWS Log No. 41910-2013-F-0194) provide a structure for mitigating impacts to scrub-jay habitat. Compensation acreages are based on the impacted habitat type grid cells (Figure 4-1) at a predetermined ratio, shown in Table 5-2. Compensation activities would involve restoration of habitat quality conditions where Florida scrub-jay recruitment exceeds mortality through means such as mechanical treating.

Habitat Classification	Footprint Adjacent to Development (ratios)	Footprint not Adjacent to Development (ratios)	Available habitat at KSC (acres)
Core	4:1	8:1	7,367
Support	2:1	4:1	3,865
Auxiliary	1:1	2:1	7,891

Table 5-2. Compensation Ratios for Designated Florida Scrub-Jay Habitat at KSC

Multiple protected species are dependent on the fire-maintained scrub habitat, including the Florida scrub-jay, eastern indigo snake, and gopher tortoise. The 1-mile operational buffer (smoke-restricted area) around the project site has the potential to restrict prescribed burning in burn units 6.2A, 6.2B, 6.3, and 7.2A, with resulting degradation of habitat and increased risk of catastrophic wildfires, both which would likely result in a decrease in scrub-jay demographic performance and usage of the area by tortoises and indigo snakes. Without prescribed fire at intervals that can maintain habitat in open medium (optimal habitat with oak height of 4.2 - 5.6 ft, closed-medium (3.9 - 5.6 ft) transitional stages, Florida scrub-jay yearling production would either decrease or would not outpace breeding bird mortality, resulting in a decrease in average birds within family groups. See the *BO for KSC SpaceX Operation and Florida Power Light (FPL) Solar Facility* for additional detail on burning in FSJ and indigo snake habitat at KSC (USFWS, 2018).

To avoid degradation of these habitats, SpaceX, NASA, and MINWR would follow conservations measures similar to those described in the KSC SpaceX Operation and FPL Solar Facility BO (USFWS, 2018) including maintenance of a 100 ft wide buffer within the parcel on the north and west sides as a defensible fire space and continued coordination among KSC, MINWR, and the proponent to ensure adequate prescribed fire in burn units 6.2A, 6.2B, 6.3, and 7.2A at the time of year deemed appropriate by KSC and MINWR. Prescribed burning would be conducted with a sufficient frequency to maintain suitable habitat and in accordance with the Memorandum of Understanding between the 45th Space Wing, the United States Fish and Wildlife Service, and John F. Kennedy Space Center for Prescribed Burning on the Merritt Island National Wildlife Refuge, John F. Kennedy Space Center, and Cape Canaveral Air Force Station, Florida, hereafter referred to as the Prescribed Burning MOU (45 SW, USFWS, and KSC, 2019). If KSC and MINWR are not able to meet the intent of the Prescribed Burning MOU for this area (6.2A, 6.2B, 6.3, and 7.2A) due to operational buffer restrictions that limit burning, then KSC would support MINWR by providing for a separate burn of a unit that contains support or core FSJ habitat. Additionally, facilities would be designed to accommodate the potential for smoke being placed on buildings.

Impacts to wetlands would be mitigated through mitigation credits and/or a Permittee Responsible Mitigation Plan, developed in coordination with the applicable regulatory agencies. The plan would enhance, restore, or create new wetlands in accordance with the requirements of the Clean Water Act. Final details regarding potential mitigation types and sites would be determined as design progresses and subject to regulatory approval.

5.3. Effects of Action on Listed Species

The following sections discuss specific effects that could result from the Proposed Action. Effects are caused by construction and operations activities associated with the SpaceX Roberts Road SpaceX Operations Area Expansion and the NPC roadway. It should be noted that impacts due to NPC assume a 200-foot wide roadway corridor as a conservative initial estimate. This footprint would be reduced as design progresses and minimization measures are applied; therefore, direct impacts are anticipated to be less than those described in this BA.

Proposed impacts to undisturbed areas would result from the Roberts Road SpaceX Operations Area Expansion and the construction of the NPC. Clearing within these areas includes up to approximately 167.5 acres in the following undisturbed habitats: shrub and brushland, wetlands, and upland forests. Construction in these areas is unavoidable due to constraints associated with the construction of the NPC and expansion of the existing operations area. The Proposed Action area consists of 0.12 percent of the total land at KSC. Habitat loss is the main direct impact to listed species but there are also indirect impacts to the habitat due to disturbance, potential import of exotic species seed source, and potential impacts to prescribed burning schedules.

Under the Proposed Action, potential impacts to listed species would be appreciably reduced by a number of minimization measures. Proposed facilities are sited along existing roadway corridors and adjacent to developed areas. NPC is proposed to generally follow the alignment of the unpaved section of Roberts Road, where practicable, to reduce impacts to undisturbed areas. The roadway footprint would be narrowed through the use of steeper slopes to reduce overall habitat impacts. Wetland hydrology impacts would be reduced by incorporating culverts or pipes under the road to allow for hydrologic connectivity.

5.3.1. FLORIDA SCRUB-JAY

Direct Impacts

The clearing for the Roberts Road SpaceX Operations Area Expansion and NPC would result in the loss of approximately 146 acres of auxiliary scrub-jay habitat. These impacts would be mitigated by the creation of compensatory mitigation habitat as outlined in the Kennedy Space Center Florida Scrub Jay Compensation Plan at a 1:1 ratio for auxiliary areas directly adjacent to development and 2:1 for auxiliary areas not adjacent to development.

Indirect Impacts

The one-mile operational buffer includes 426.9 acres of core habitat, 828.3 acres of support habitat, and 1,993.6 acres of auxiliary habitat. SpaceX would coordinate with KSC and MINWR on prescribed burns within the operational buffer to limit disruptions to burn schedules.

Prescribed burning would be conducted with a sufficient frequency to maintain suitable habitat and in accordance with the *Memorandum of Understanding between the 45th Space Wing, the United States Fish and Wildlife Service, and John F. Kennedy Space Center for Prescribed Burning on the Merritt Island National Wildlife Refuge, John F. Kennedy Space Center, and Cape Canaveral Air Force Station, Florida* (45 SW, USFWS, and KSC, 2019). If KSC and MINWR are not able to meet the intent of the Prescribed Burning MOU for this area (6.2A, 6.2B, 6.3, and 7.2A) due to operational buffer restrictions that limit burning, then KSC would support MINWR by providing for a separate burn of a unit that contains support or core FSJ habitat.

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 action area. The potential for exotic species to colonize in the action area may reduce the available quality habitat for this species.

Due to impacts on auxiliary scrub-jay habitat, NASA has determined the Proposed Action *may affect, and is likely to adversely affect* the Florida scrub-jay.

5.3.2. EASTERN INDIGO SNAKE

The Proposed Action would result in the loss of approximately 150 acres of potential eastern indigo snake habitat (shrub and brushland, upland forest, and wetlands for feeding) that includes disturbed habitat with gopher tortoise burrows that could be used by this species as refugia. The potential for exotic species to colonize within the action area may reduce the available quality habitat for this species. No eastern indigo snakes or signs of this species were observed during site reconnaissance and large tracts of undeveloped habitat similar to that to be impacted are adjacent to the Proposed Action. The Standard Protection Measures for the Eastern Indigo Snake (USFWS 2021) would be implemented.

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 considered short-term and would not cause a negative impact to the eastern indigo snake within the action area. Actual noise impacts on this species are expected to be minimal.

Due to the impact of eastern indigo snake habitat and potential for indirect take, NASA has determined the Proposed Action *may affect, but is not likely to adversely affect* this species.

5.3.3. SOUTHEASTERN BEACH MOUSE

There would be no direct impacts on southeastern beach mice under the Proposed Action. The Roberts Road SpaceX Operations Area, proposed expansion area, and proposed NPC are over six (6) miles from the beach dunes at the closest point. There is no suitable habitat for the southeastern beach mouse within the action area. As such, take of beach mice is not expected to occur. Additionally, due to the distance from potential habitat, potential noise-related effects to the southeastern beach mouse during construction activities is not expected.

Due to the lack of impact to potential southeastern beach mouse habitat or potential for indirect take, NASA has determined the Proposed Action would have *no effect* on this species.

5.3.4. MARINE TURTLES

There would be no direct impacts on marine turtles under the Proposed Action. Sky glow from nighttime lighting may affect hatching marine turtles, causing them to crawl in the wrong direction (i.e., away from the ocean). The BO (FWS Log No. 04EF1000-2016-F-083) for the KSC Master Plan concurred with NASA's finding of *may affect, likely to adversely affect* for marine turtles. The BO included analysis for launch complexes and other facilities along the dunes as well as artificial lighting from other sources at KSC. The distance from the Roberts Road SpaceX Operations Area, proposed expansion area, and proposed NPC is over six (6) miles from nesting habitat at the closest point.

The use of an approved lighting management plan for exterior lighting would reduce potential disorientation of sea turtles and hatchlings at the beach. Due to the distance from the nesting habitat and potential indirect effect from lighting Roberts Road SpaceX Operations Area on beach nesting and hatchling marine turtles, NASA has determined the Proposed Action *may affect, but is not likely to adversely affect* these species.

5.3.5. WEST INDIAN MANATEE

There would be no direct impacts on the West Indian Manatee under the Proposed Action. The Proposed Action contains no habitat for this species and their presence in the project vicinity is limited to the Indian River Lagoon to the west.

Manatees would not be affected by vibration and noise associated with construction activities since they are not in the action area. Additionally, due to the distance from potential habitat, potential noise-related effects to the manatee during construction activities is not expected. Stormwater runoff from impervious surfaces would be collected and treated in stormwater management facilities within the Proposed Action areas and would not significantly impact water quality within the Indian River Lagoon.

Due to the lack of impact to potential West Indian manatee habitat or potential for indirect take, NASA has determined the Proposed Action would have *no effect* on this species.

5.3.6. AMERICAN ALLIGATOR

Direct Impacts

The Proposed Action would impact up to approximately 106 acres of wetlands and waterways that are suitable habitat for the American alligator. It is reasonable to expect that this species could utilize suitable habitat within the action area. The primary concern for impacts to this species is the loss of habitat; however, suitable wetland habitat is prevalent in the adjacent KSC and MINWR area. In addition, wetland impacts resulting from construction of the Proposed Action would be mitigated to prevent the net loss of wetland functions and values.

Indirect Impacts

Reptiles and amphibians are sensitive to vibrations, which provide information about approaching predators and prey. Vibration and noise associated with construction activities could cause short-term disturbance to an alligator. These impacts would be considered short-term and would not affect alligators within the action area. Actual noise impacts on this species are expected to be minimal. Stormwater runoff from impervious surfaces would be collected and treated in stormwater management facilities within the action area and would not impact water quality in areas adjacent to the Proposed Action. The potential for exotic species to colonize within the action area may reduce the available quality habitat for this species.

Based on the commitment to mitigate wetland impacts, NASA has determined the Proposed Action *may affect, but is not likely to adversely affect* this species.

5.3.7. WOOD STORK

The action area contains freshwater marsh wetlands that are considered SFH (12.5 acres) for this species. The primary concern for impacts to this species is the loss of habitat; however, suitable wetland habitat is prevalent in the adjacent KSC and MINWR area. The potential for exotic species to colonize within the action area may reduce the available quality habitat for this species. Noise associated with construction may startle many species within the KSC/MINWR area; however, actual noise impacts on this species are expected to be minimal.

Wetland impacts resulting from construction of the Proposed Action would be mitigated to prevent the net loss of wetland functions and values. Additionally, roadside ditches constructed along NPC would provide foraging habitat for the wood stork. NASA has determined the Proposed Action *may affect but is not likely to adversely affect* the wood stork.

5.3.8. PIPING PLOVER

The piping plover forages along the Indian River Lagoon and Atlantic shorelines, and nesting has been documented in Brevard County. The Roberts Road SpaceX Operations Area, proposed expansion area, and proposed NPC are over six (6) miles from the beach dunes at the closest point. There is no suitable nesting or foraging habitat for the piping plover within the action area. As such, take of piping plovers or nest sites is not expected to occur. Additionally, due to the distance from potential habitat, noise-related and lighting disturbance on piping plovers during construction activities is not expected. As a result, the Proposed Action would not impact piping plover habitat.

Due to the lack of impact to potential piping plover habitat or potential for indirect take, NASA has determined the Proposed Action would have *no effect* on this species.

5.3.9. RED KNOT

The red knot is recognized as a visitor that forages along the Atlantic coast shoreline and adjacent saltwater habitats such as mudflats and salt marshes during its migration. The Roberts Road SpaceX Operations Area, proposed expansion area, and proposed NPC are over six (6) miles from the beach dunes at the closest point. There is no suitable nesting or foraging habitat for the red knot within the action area. As such, take of red knot or nest sites is not expected to occur.

Additionally, due to the distance from potential habitat, noise-related and lighting disturbance on red knots during construction activities is not expected. As a result, the Proposed Action would not impact red knot habitat.

Due to the lack of impact to potential red knot habitat or potential for indirect take, NASA has determined the Proposed Action would have *no effect* on this species.

5.3.10. EASTERN BLACK RAIL

The Proposed Action would impact 12.5 acres of marsh wetland that are suitable habitat for the eastern black rail. It is reasonable to expect that this species could utilize suitable habitat within the action area. The potential for exotic species to colonize within the action area may reduce the available quality habitat for this species. The primary concern for impacts to this species is the loss of habitat; however, similar suitable wetland habitat is prevalent in the adjacent KSC and MINWR area. In addition, wetland impacts resulting from construction of the Proposed Action would be mitigated to prevent the net loss of wetland functions and values.

Based on the commitment to mitigate wetland impacts, NASA has determined the Proposed Action *may affect, but is not likely to adversely affect* this species.

6. CONSERVATION MEASURES FOR AFFECTED SPECIES

6.1. General Construction

- Construction areas shall be clearly marked or staked to designate the limits of clearing and earth work. A sediment and erosion control plan would be prepared and best management practices would be implemented to minimize the potential for adverse impacts to water quality and wetlands. A controlled area for construction material and equipment staging would be established.
- 2. Sites requiring timber clearing and the creation of burn piles would ensure that piles are ignited from one side only so that eastern indigo snakes and other wildlife in the pile can have a route of escape away from the fire.
- 3. During construction, topsoil would be removed and stockpiled wherever possible and reused in the area where it was salvaged. After construction is complete, the establishment of a native vegetative cover where practicable would aid in the reestablishment of biological activity in the soil.
- 4. Disturbed project areas would be revegetated or reseeded with native plant species, where practicable, once construction is complete. This would minimize soil erosion, inhibit the establishment and propagation of invasive exotic plant species, and reestablish the natural vegetation community.
- 5. Best management practices would be utilized during construction to ensure that impacts of invasive species do not surpass the threshold of significance. Invasive species would be removed from the construction site as they are identified.

- 6. Heavy equipment used for construction or ground clearing would be cleaned and weedfree prior to entering the project area.
- 6.2. Prescribed Burning

Prescribed burning would be conducted with a sufficient frequency to maintain suitable habitat and in accordance with the *Memorandum of Understanding between the 45th Space Wing, the United States Fish and Wildlife Service, and John F. Kennedy Space Center for Prescribed Burning on the Merritt Island National Wildlife Refuge, John F. Kennedy Space Center, and Cape Canaveral Air Force Station, Florida* (45 SW, USFWS, and KSC, 2019). If KSC and MINWR are not able to meet the intent of the Prescribed Burning MOU for this area (6.2A, 6.2B, 6.3, and 7.2A) due to operational buffer restrictions that limit burning, then KSC would support MINWR by providing for a separate burn of a unit that contains support or core FSJ habitat. Fire management units are managed on a three to five-year prescribed burn rotation.

SpaceX would construct a 100-foot defensible space around the western and northern site boundary to implement burn management practices. A Avenue would act as a fire barrier to the east and the existing SpaceX Roberts Road Operations Area is immediately adjacent to the south.

6.3. Species-Specific Measures

6.3.1. FLORIDA SCRUB-JAY

To compensate for impacts from habitat loss, SpaceX would follow the process outlined in the *Kennedy Space Center Florida Scrub-Jay Compensation Plan*. This document identifies the types and location of scrub-jay habitat and compensation ratios based on habitat types. As previously described, impacts would be mitigated at a 1:1 ratio for auxiliary areas directly adjacent to development and 2:1 for auxiliary areas not adjacent to development.

Prior to clearing of suitable scrub-jay habitat, surveying would be conducted to ensure that no jays are nesting within 300 feet of clearing activities. All suitable scrub-jay habitat would be surveyed for nesting jays. Any nests encountered would be flagged and no clearing would be allowed within 300 feet until all birds have fledged.

6.3.2. EASTERN INDIGO SNAKE

SpaceX would comply with the Standard Protection Measures for the Eastern Indigo Snake. As part of the Standard Protection Measures for the Eastern Indigo Snake, a Protection/Education Plan would be presented to SpaceX employees, the construction manager, and construction personnel. Educational signs would be displayed at the site to inform personnel of the snake's appearance, its protected status, and who to contact if any are spotted in the area. If any indigo snakes are encountered during clearing activities, they would be allowed to safely move out of the project area. Any observations of live or dead indigo snakes would be reported to the KSC and MINWR staff immediately, who would then report it to USFWS Ecological Services if appropriate.

Immediately prior to initial site clearing activities, a qualified biologist shall be present during site clearing of eastern indigo snake habitat and any gopher tortoise excavation activities to ensure eastern indigo snakes are not harmed or handled. A qualified biologist will survey previously discovered gopher tortoise burrows, and if inhabited by an eastern indigo snake, then the snake will be allowed to vacate the burrow prior to collapsing the burrow.

Artificial refugia (construction debris, abandoned pipe, etc.) in the project area shall be carefully inspected to ensure that no eastern indigo snakes are present before being dismantled, moved, or destroyed.

6.3.3. MARINE TURTLES

Lighting management plans would be prepared in accordance with the KSC exterior lighting requirements described in KNPR 8500.1, Revision E, the Biological Opinion (BO) (FWS Log No. 04EF1000-2016-F-083), and KSC-PLN-1210, Rev A on artificial lighting at KSC. Conservation measures included in this BO include the following:

- Using special long-wavelength lighting with exceptions where color rendition is an operational or safety requirement. A waiver would be required for use of noncompliant lighting;
- Using only the minimum lighting required for safety and security;
- Keeping light fixture mounting heights as low as possible while shielded from direct view of the beach; and
- Developing facility specific Lighting Operations Manuals to ensure only authorized use of lighting for all new construction and facility upgrades.

6.3.4. AMERICAN ALLIGATOR

Construction and operations personnel would be advised of the potential presence of alligators in and adjacent to the Proposed Action area and disturbance to nests is not authorized. Additionally, SpaceX would be responsible for ensuring all personnel understand the laws regarding the feeding of alligators. Any personnel observed feeding alligators would be reported to the appropriate authorities.

7. SUMMARY OF POTENTIAL EFFECTS AND CONSERVATION MEASURES

A summary of potential effects to ESA listed species, the Section 7 finding, and proposed conservation measures are included below in Table 7-1.

Common Name (Scientific	Stat	us ¹	Occurrence	Potential Impacts	Section 7 Finding	
Name)	USFWS	S FWC			Ŭ	
Florida Scrub-Jay (<i>Aphelocoma coerulescens</i>)	т	Т	Potential	 Loss of habitat direct and indirect (exotic plant colonization and burning restrictions) Roadway traffic 	May affect, likely to adversely affect	Genera Pre-cor Follow Prescril
Eastern Indigo Snake (<i>Drymarchon corais couperi</i>)	т	Т	Potential	 Crushing by equipment Loss of habitat (direct and indirect) Roadway traffic 	May affect, but not likely to adversely affect.	 Easterr Pre-cor collapsi Artificia Genera
Southeastern Beach Mouse (Peromyscus polinotus niveiventris)	т	Т	No habitat	No impacts	No effect	N/A
Leatherback Turtle (<i>Dermocheyls coriacea</i>)	E	E	No habitat			
Loggerhead Turtle (<i>Caretta caretta</i>)	т	Т		Nighttime lighting	May affect, but not likely to	Lighting
Kemps Ridley Turtle (<i>Lepidochelys kempii</i>)	E	E			adversely affect	require
Hawksbill Turtle (<i>Eretmochelys imbricata</i>)	E	E				
West Indian Manatee (<i>Trichechus manatus)</i>	т	т	No habitat	No impacts	No effect	N/A
American Alligator (<i>Alligator mississippiensis</i>)	T (S/A)	T (S/A)	Potential	Loss of habitat (direct and indirect)Roadway traffic	May affect, but not likely to adversely affect	WetlandGeneraContract
Wood Stork (<i>Mycteria</i> americana)	т	т	Potential	Loss of foraging habitat (direct and indirect)Roadway traffic	May affect, but not likely to adversely affect	WetlandGeneral
Piping Plover (Charadrius melodus)	т	Т	No habitat	No impacts	No effect	N/A
Red Knot (<i>Calidris canutus)</i>	Т	Т	No habitat	No impacts	No effect	N/A
Eastern Black Rail (<i>Laterallus jamaicensis jamaicensis</i>)	т	Т	Potential	Loss of habitat (direct and indirect)Roadway traffic	May affect, but not likely to adversely affect	WetlandGeneral

Table 7-1. Potential Impacts, Section 7 Finding, and Conservation Measures for Federal and State Protected Wildlife Species that Occur or Have Potential to Occur within the Proposed Action Area

Note^{1:} Legend: (T) Threatened; (E) Endangered; (S/A) Similarity of Appearance

ROBERTS ROAD SPACEX OPERATIONS AREA EXPANSION AT KENNEDY SPACE CENTER

Conservation Measure

- al construction conservation measures
- nstruction surveys
- KSC Florida-Scrub-Jay Compensation Plan
- bed burning
- indigo snake Standard Protection Measures
- nstruction surveys and removal during gopher tortoise burrow ing
- I refugia inspections during construction
- al construction conservation measures

management plans in compliance with KSC exterior lighting ments and marine turtles BO

d mitigation to offset habitat loss al construction conservation measures ctor training to understand alligator feeding laws

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8. CUMULATIVE IMPACTS

Potential Future projects at KSC are described in the Master Plan Programmatic Environmental Impact Statement (NASA 2016) and Kennedy Space Center Vision Plan (NASA 2020b). Future projects at KSC include construction, renovation, and improvements at the following types of facilities:

- Vertical launch pads and landing areas
- Horizontal launch and landing areas
- Launch operations and support areas
- Assembly, testing, and processing areas
- Utility systems areas and corridors
- Administration facilities
- Support services facilities

- Public outreach facilities
- Research and development facilities
- Road improvements, repair, and resurfacing
- Bridge replacement
- Parking lot repurposing or demolition
- Expansion of the horizontal launch and landing capability with a new runway

Potential cumulative adverse impacts could occur at KCS for the Florida scrub-jay, eastern indigo snake, gopher tortoise, eastern black rail, wood stork, and American alligator when evaluated with these additional developments due to habitat loss. The Proposed Action is immediately adjacent to the existing Roberts Road SpaceX Operations Area, which is a 67-acre site currently under construction. The FPL Discovery Solar Center immediately to the southwest was also recently constructed. Impacts from both projects were considered in the 2018 *BO for KSC SpaceX Operation and FPL Solar Facility* and consist of similar habitat as the Proposed Action. The Proposed Action includes conservation measures that were proposed in the 2018 BO to reduce and avoid adverse effects on habitat and species, and as such are not likely to result in an adverse effect on these species.

Lighting associated with the Proposed Action would increase the baseline condition for nighttime lighting at KSC, but is not expected to result in adverse impacts to marine turtles as all development at KSC is required to comply with the KSC exterior lighting requirements and conservation measures agreed upon in the marine turtle BO.

Cumulative impacts on the southeastern beach mouse, piping plover, red knot, and West Indian manatee are not expected to occur with the Proposed Action as there is no habitat that supports these species in this area.

Future projects would only utilize a fraction of available habitat at KSC. The remaining available habitat in conjunction with MINWR would ensure that the cumulative habitat loss would not jeopardize the continued existence of species listed in this BA. Future projects would be subject to compensatory wetland and scrub-jay mitigation in accordance with state, federal, and KSC regulations. Projects at KSC would be subject to Section 7 of the ESA, and as such would have their own consultations.

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