FINAL ENVIRONMENTAL ASSESSMENT
FOR
SPACE EXPLORATION TECHNOLOGIES OPERATIONS AREA
ON
KENNEDY SPACE CENTER

Prepared for
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October 2, 2018

Executive Summary

Space Exploration Technologies Corporation (SpaceX) has prepared this Environmental Assessment (EA), with NASA as Lead Agency, to evaluate the potential environmental impacts resulting from operations and construction associated with development of a SpaceX Operations Area on John F. Kennedy Space Center (KSC). Federal agencies are required to consider environmental consequences resulting from their actions. This is in accordance with regulatory mandates including the National Environmental Policy Act (NEPA) of 1969, as amended (Title 42 of the United States Code [U.S.C.] 4321 - 4347), 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). As SpaceX and NASA are considering development on the federal property of KSC, this EA is necessary to support agency compliance with NEPA and related federal and state environmental regulations.

Purpose and Need

The purpose of this action is to develop a site that supports the multiple requirements of SpaceX in its pursuit of a complete local, efficient, and reusable launch vehicle program. With launch and landing sites already operational at KSC and Cape Canaveral Air Force Station (CCAFS), this action would provide a location for booster and fairing processing and storage, and a launch and landing control center. The action would be partial fulfillment of the United States (U.S.) expectation of more affordable transportation, exploration, development, and use of space. The Space Transportation section of the National Space Transportation Policy of 2013 addressed the commercial launch sector, stating that "assuring reliable and affordable access to space through U.S. space transportation capabilities is fundamental to achieving National Space Policy goals".

This action is needed in order to increase the effective and cost efficient operation of space flight by providing Space X with facilities to support staff in planning, processing, and operating launches as part of their current returnable, re-usable space vehicles program (Falcon 9 and the Falcon Heavy), which is already in place at launch complexes on KSC and CCAFS. The proposed site on Roberts Road offers a location close to multiple SpaceX operations. In order for the U.S. to be competitive, the cost and frequency of launches needs to keep pace with world demand which necessarily includes reusing booster stage vehicles.

From NASA's perspective, the action is to develop and implement an Enhanced Use Lease (EUL) for the Roberts Road property on KSC. 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 need for the Proposed Action also aligns with NASA's Space Act Agreement (SAA) and the Federal Aviation Administration (FAA) Office of Commercial Space Transportation's mission, which is to support the U.S. goal of encouraging activities by the private sector to strengthen and expand U.S. space transportation infrastructure.

Proposed Action

SpaceX proposes to develop a site for booster and fairing processing and storage, a new launch and landing control center and a rocket garden at KSC. These facilities will support the growing Falcon 9 and Falcon Heavy launch manifests at Launch Complex (LC) -39A and LC-40. SpaceX has plans to refurbish Area 59 on CCAFS, formerly used for satellite processing, as a site for Dragon processing.

SpaceX estimates there may be up to ten events per year for a Falcon Heavy launch, and up to 63 landings (54 Falcon 9 single core landings and nine Falcon Heavy triple core landings) at the current CCAFS landing site or on the SpaceX drone ship.

This Roberts Road site would require approximately 27 hectares (ha) (67 acres [ac]) of land for proposed facility development. Roberts Road and A Avenue would be paved to provide access on the south and north sides. A conceptual site plan is provided in Section 2 (Figure 2-1). SpaceX requires the booster and fairing processing and storage facility immediately to support a growing launch manifest and enable reuse. In the future, additional facilities may be required for manifest support or new launch vehicle specifications. However, at this time, the scope of future needs has not been defined and these facilities are not in planned development.

The purpose of the Proposed Action from NASA's perspective is to enable improved access to KSC's space launch and test operation capabilities by commercial and other non-NASA users, and to advance NASA's mission by fostering a commercial space launch and services industry. NASA's action is to develop and implement an EUL for the Roberts Road property. Commercial use of KSC real property supports NASA's mandate to encourage the fullest commercial use of space and helps ensure that U.S. Government space technology and infrastructure is made available for commercial use on a reimbursable, noninterference, and equitable basis. This action also furthers the goals of KSC long-term planning initiatives, NASA programmatic objectives, and ultimately increases American competitiveness in commercial space. The proposed SpaceX site would be a direct fulfillment of the KSC Master Plan to "foster and support the fullest commercial use of space".

No Action Alternative

Under the No Action Alternative, the EUL for the KSC property would not occur. The SpaceX Roberts Road Operations Area would not be built. SpaceX's ability to fully meet the National Space Transportation Policy goals of providing low cost reliable access to and from space would be negatively affected.

Summary of Potential Environmental Effects

This EA considered the following 14 resource areas to provide a context for understanding the potential environmental effects of the Proposed Action and alternatives: land use/visual resources, noise, biological resources, cultural resources, air quality, climate, hazardous materials/hazardous waste (includes solid waste and pollution prevention), water resources, geology and soils, transportation, utilities, health and safety, socioeconomics, and environmental justice.

The environmental consequences associated with the Proposed Action and the No Action Alternative were analyzed for the appropriate Region of Influence (ROI) for each resource area. The following table presents a summary of the resources considered and the potential impacts on those resources. The descriptions include both construction and operations related tasks associated with this Proposed Action.

Table E-1. Summary of Potential Environmental Impacts from the Proposed Action and the No Action Alternative

Resource Area	Potential Environmental Impact from Proposed Action
Land Use/Visual Resources	The SpaceX Roberts Road Operations Area would require a land use change from Renewable Energy to Assembly, Testing and Processing. The site is currently managed by USFWS and would be removed from Merritt Island National Wildlife Refuge (MINWR) oversight. The land would no longer be available for controlled burning operations. NASA shall notify SpaceX of planned prescribed burns of adjacent property within a reasonable amount of time to allow coordination with SpaceX. The change in land use designation and removal from MINWR would result in a moderate impact. The impact of the Proposed Action to visual resources would be moderate. The proposed site is outside of the public access area with exception of Visitor Complex tour buses and visitors during launch viewing events. Though the SpaceX Operations Area would require some construction and modifications to roads and utilities, these additions would be consistent with existing infrastructure and not cause a significant impact to the area. The Proposed Action is also consistent with the Florida Coastal Management Plan and would result in no significant impact to the coastal zone.
Noise	There would be minimal impacts from noise levels during construction and operations activities. Minimal impact over the long-term would occur at the SpaceX Operations Area on Roberts Road as this site is currently an undeveloped abandoned agricultural area. These operations would be consistent with ongoing and historic processes at KSC. The workforce would be protected from undue noise impacts by the Occupational Safety and Health Administration (OSHA) safety practices in place at KSC. Noise generated during construction activities of the Proposed Action would potentially have discernable, but temporary effects on wildlife occurring nearby. Most wildlife occurring close to noise sources would be free to move away or find shelter (e.g., burrows); therefore, the impacts would be expected to be minimal. There would be no impacts to typical noise levels from normal daily operations experienced currently by communities adjacent to KSC property.
Biological Resources	For the SpaceX Roberts Road site, the impacts would be minimal. The majority of the habitat is highly disturbed and comprised of non-native species. Loss of the small acreage of natural habitat (hardwood hammock) would not have significant impact. A potential wildlife consequence would be loss of eastern indigo snake habitat, which would be small and expected to have minimal impact. Temporary impacts to gopher tortoises from extension of power lines along State Road 3 would be moderate but lessened by mitigation measures. The height of the proposed Launch and Landing Control Center might impact migratory birds in terms of potential collisions. Mitigation to reduce bird collisions will be addressed in the final design and will comply with all FAA obstruction and marking guidelines.

Resource Area	Potential Environmental Impact from Proposed Action
Cultural Resources	No impacts are expected to any cultural resources from the proposed action.
Air Quality	Normal construction-related and operational air emissions from the Proposed Action would be of minimal and short duration impact to air quality in the region. KSC and Brevard County are classified as an attainment area and the operational emissions represent an extremely small percentage of the Brevard County regional emissions. Temporary increases in local vehicle use, and construction and land clearing equipment would be insignificant and these fugitive emissions would not be substantial enough to change National Ambient Air Quality Standards (NAAQS) attainment status.
Climate and Climate Change/Sea Level Rise	There would be no impact on the current regional climate from construction and operations. Based upon the expected annual mean direct emissions of greenhouse gasses of well under 25,000 metric tons (mt), there would be minimal impact from the Proposed Action on the global climate.
Hazardous Materials/ Hazardous Waste	Hazardous materials and solid and hazardous wastes are managed and controlled in accordance with federal and state regulations. KSC has established plans and procedures to implement these regulations. During construction and operation phases, SpaceX would implement standard hazardous material and hazardous waste handling to prevent impact to the environment. Pollution Prevention best management practices (BMPs) would be used to minimize potential impacts to the environment through the reduction of hazardous materials and hazardous waste. Hazardous materials such as propellants, chemicals, and other hazardous material payload components would be transported to the facilities in accordance with Florida Department of Transportation (DOT) regulations. Continued implementation of existing material and waste management and handling procedures currently used during the operation of similar facilities would limit or eliminate the potential for impacts. Therefore, there would be minimal impacts to the environment.

Resource Area	Potential Environmental Impact from Proposed Action
Water Resources	The addition of impervious surfaces would reduce the area available for rainwater percolation into the soil and less water would be available for recharging the local surficial aquifer and groundwater; runoff into low-lying areas would increase. Mitigation through stormwater management could reduce these impacts. However, extreme rainfall events associated with tropical systems would likely exceed the capacity of most stormwater systems, and some runoff could be transported off-site. Stormwater management systems would be built to treat runoff from new impervious surfaces. An Environmental Resource Permit (ERP) would be obtained from the St. Johns River Water Management District (SJRWMD). BMPs such as silt fences and turbidity barriers, and construction of stormwater management systems would reduce groundwater quality impacts to a minimal amount. Moderate impacts to surface water quality during land disturbances associated with construction would also be lessened with the implementation of BMPs.
Geology and Soils	There are no unique geologic features of exceptional interest or mineral resources within the project area. Overall impacts would be considered none to geology and minimal to soils.
Transportation	While there would be more vehicle and truck traffic during the construction period, it would not cause significant impacts to KSC traffic or roadways. While some roadways at KSC will experience an increase in traffic for new employees and spacecraft component transport, operational traffic would not cause a significant impact. The Proposed Action is not expected to have appreciable changes in the overall traffic volume at KSC, however, some components could affect the level of service at intersections or roadways both on and off the facility. Overall transportation impacts are classified as moderate due to increased traffic on roadways, potential temporary road closures, and proposed improvements to Roberts Road, A Avenue, and State Road 3.
Utilities	Impacts to electricity, natural gas, communications, wastewater, and solid waste infrastructure at KSC would be minimal to moderate. A feasibility study is under way to quantify electric and wastewater impacts and review mitigation options. Potential moderate impacts could result from industrial wastewater discharges but would be lessened through acquiring proper permits and following permit conditions. Some utilities ducts would need to be laid and tie-ins established, but additional demands on these services would be readily absorbed. Water supply impacts during construction would also be minimal since potable water resources are available at or near proposed site. Impacts to water supply and treatment to support on site operations are classified as minimal.

Resource Area	Potential Environmental Impact from Proposed Action
Health and Safety	SpaceX would follow all KSC and OSHA regulations during construction activities and no significant impact to health and safety of workers would be expected. Similarly, all current health and safety local, state, and federal procedures would be followed during operations, and no significant impact to health and safety of workers would be expected. The severity of an unplanned event is unlikely to increase. While the probability of an accidental release would increase due to increased activities and quantity of materials, best management practices would ensure the increase in risk is minimal, with the probability of a major spill kept to a minimum.
Socioeconomics	The SpaceX Roberts Road development would cause a positive impact to the local economy from direct labor use and from indirect material and consulting purchasing.
Environmental Justice	There would be no impacts to Environmental Justice communities.

Cumulative Impacts

Cumulative impacts are defined by the CEQ in 40 CFR §1508.7 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. The CEQ regulations further require that NEPA environmental analyses address connected, cumulative, and similar actions in the same document (40 CFR 1508.25). The cumulative impact analysis for this EA focuses on the incremental interaction the Proposed Action may have with other past, present, and reasonably foreseeable future actions, and evaluates cumulative impacts potentially resulting from these interactions. The past, present, and reasonably foreseeable future actions at KSC, CCAFS, and Port Canaveral focus on constructing facilities and improving transportation modes, spacecraft processing and launch, the cruise and cargo industry, and their cumulative impacts. The Proposed Action combined with current and future actions would result in moderate cumulative effects to land use, visual resources, biological resources, water resources, and utilities. Implementation of the Proposed Action would not likely cause any significant cumulative impacts to the remaining local resource areas evaluated.

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ACRONYMS AND ABBREVIATIONS

ac	acres
AFSPC	Air Force Space Command
AOC	Area of Concern
BMP	Best Management Practice
C	Celsius
CCAFS	Cape Canaveral Air Force Station
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cm	centimeters
CNS	Canaveral National Seashore
CO	Carbon monoxide
CO_2	Carbon dioxide
COC	Constituents of Concern
CS	Confirmatory Sampling
CZMA	Coastal Zone Management Act
dB	decibels
dBA	A weighted sound pressure level
DOT	Department of Transportation
EA	Environmental Assessment
EO	Executive Order
EPA	Environmental Protection Agency
ERD	Environmental Resources Document
ERP	Environmental Resource Permit
EUL	Enhanced Use Lease
F	Fahrenheit
FAA	Federal Aviation Administration
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FEMA	Federal Emergency Management Agency
FIRM	FEMA Flood Insurance Rate Maps
FPL	Florida Power and Light
ft	feet
ft^2	square feet
F.S.	Florida Statute
gal	gallon
GPS	Global Positioning System
GSDO	Ground Systems Development and Operations
ha	hectares
HAP	Hazardous Air Pollutants
HMF	Hypergol Maintenance Facility
ICRMP	Integrated Cultural Resource Management Plan
IM	Interim Measure
in	inches
IPA	Isopropyl alcohol
IRL	Indian River Lagoon
ISS	International Space Station
km	kilometers
KSC	John F. Kennedy Space Center
l	liter
lbs	pounds
LC	Launch Complex
LOX	liquid oxygen
LUC	Land Use Control
LZ-1	Landing Zone 1
MHz	megahertz
m	meters
m^2	square meters
mi	miles
MINWR	Merritt Island National Wildlife Refuge
mph	miles per hour
mt	metric tons
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NFA	No Further Action
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOx	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NPR	NASA Procedural Requirement
NPS	National Park Service
NRO	National Reconnaissance Office
OFW	Outstanding Florida Waters
OSHA	Occupational Safety and Health Administration
Pb	lead
PCB	polychlorinated biphenyl
PEIS	Programmatic Environmental Impact Statement
PM10	particulate matter less than or equal to 10 microns in diameter
PM2.5	particulate matter less than or equal to 2.5 microns in diameter
PRL	Potential Release Location
QD	quantity distance
RCRA	Resource Conservation and Recovery Act
RF	radio frequency
ROI	Region of Influence
SAA	Space Act Agreement
SCS	Soil Conservation Service
SJRWMD	St. Johns River Water Management District
SLF	Shuttle Landing Facility
SO_2	sulfur dioxide
SpaceX	Space Exploration Technologies
SPCC	Spill Prevention, Control, and Countermeasures

SWMU	Solid Waste Management Unit
TMDL	Total Maximum Daily Loads
UDMH	unsymmetrical dimethyl hydrazine
$\mu g/m^3$	micrograms per liter
U.S.	United States
USAF	United States Air Force
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service
UST	underground storage tank
VAB	Vehicle Assembly Building
VOC	Volatile Organic Compounds
WWTF	Waste Water Treatment Facility
VOC	Volatile Organic Compounds
WWTF	Waste Water Treatment Facility

1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 Introduction

A proposed plan is under evaluation in this Environmental Assessment (EA) for the development and operation of a Space Exploration Technologies Corporation (SpaceX) site on John F. Kennedy Space Center (KSC) in central Florida. This would include a launch and landing control center, a booster and spacecraft fairing processing and storage facility, a rocket garden, and utilities yard. Federal agencies are required to consider environmental consequences resulting from their actions. This is in accordance with regulatory mandates including the National Environmental Policy Act (NEPA) of 1969, as amended (Title 42 of the United States Code [U.S.C.] 4321 - 4347), 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. As SpaceX and NASA are considering SpaceX's plan to develop a site for SpaceX operations at KSC via execution of an Enhanced Use Lease (EUL), this EA is necessary to support NASA compliance with NEPA, as well as related federal and state environmental regulations.

1.2 Location and Background

NASA was created in 1958 to lead the nation's civilian space exploration and aeronautical technology development activities. In 1962, NASA began acquiring property to be used as a base for launch operations in support of the Manned Lunar Landing Program. A Launch Operations Center, later known as KSC, was established in Merritt Island, Florida. KSC is situated along the east coast of central Florida approximately 242 kilometers (km) (150 miles [mi]) south of Jacksonville, 322 km (200 mi) north of Miami, and 64 km (40 mi) east of Orlando (Figure 1-1). KSC is located within Brevard and Volusia counties and is comprised of approximately 57,400 hectares (ha) (142,000 acres [ac]). Today, NASA continues to operate KSC as the nation's primary federal spaceport for government and commercial access to space. NASA at KSC was responsible for ground processing, launch, and landing activities for the Space Shuttle Program which was retired in 2011. NASA is furthermore engaged in developing new capabilities to implement future space programs and the development of the commercial space industry, including support of Exploration Park, Starfighter Aerospace, race car engine testing on the Shuttle Landing Facility (SLF) runway, and Zero-G Corporation flights. NASA encourages the use of KSC property by other governmental agencies, commercial space and related industries, and universities through EULs and Space Act Agreements (SAAs). Property agreements at KSC include the Florida Power and Light (FPL) photovoltaic facilities, Boeing's use of the former Orbiter Processing Facility 3 for manufacturing and testing of the CST-100 Starliner, the Blue Origin Manufacturing Facility in Exploration Park, and the Commercial Space Launch Act agreement with SpaceX for processing and launch of their Falcon vehicles at Launch Complex (LC)-39A.

The Proposed Action would support the NASA goal of encouraging activities by the private sector to strengthen and expand U.S. space transportation infrastructure. It would provide greater mission capability to support the International Space Station (ISS) and commercial enterprises for both the United States Air Force (USAF) and NASA. The Programmatic Environmental Impact Statement (PEIS) for the KSC Master Plan, completed in November 2016, describes the current environmental setting and long range planning

(2012-2032) for KSC and provides significant supporting material for this EA. Programmatic NEPA documents are broad in scope and may be followed by more site- or action-specific documents as appropriate. This is referred to as tiering, with the broader document on top and the more focused documents below it. The KSC PEIS was prepared to evaluate potential environmental impacts from center-wide KSC operations, activities, and facilities; consider scenarios for repurposing existing facilities; reorganize management of KSC and its land resources; and continue partnerships with government organizations and commercial entities. SpaceX, with NASA as the lead federal agency, has prepared this EA as a document tiered from the KSC PEIS, focusing on development of an east coast site in support of cargo and crew missions to the ISS and deep space.

This EA was prepared by SpaceX as the proponent of the proposed action; NASA is the lead federal agency, in cooperation with the U.S. Fish and Wildlife Service (USFWS). As the landowner, NASA is responsible for managing areas on KSC for space-related development and operations. The USFWS manages KSC land not specifically used for space-related operations, as the Merritt Island National Wildlife Refuge (MINWR).

KSC provides oversight for current non-NASA space and technology development use of its property, and would be responsible for establishing and coordinating appropriate use agreements and operating procedures for those activities outlined in the Proposed Action. The various components of the Proposed Action are described in detail in Section 2. The general vicinity and potential locations for the activities on KSC are shown in Figures 1-1.

Figure 1-1. Proposed SpaceX Operations Area Location on KSC

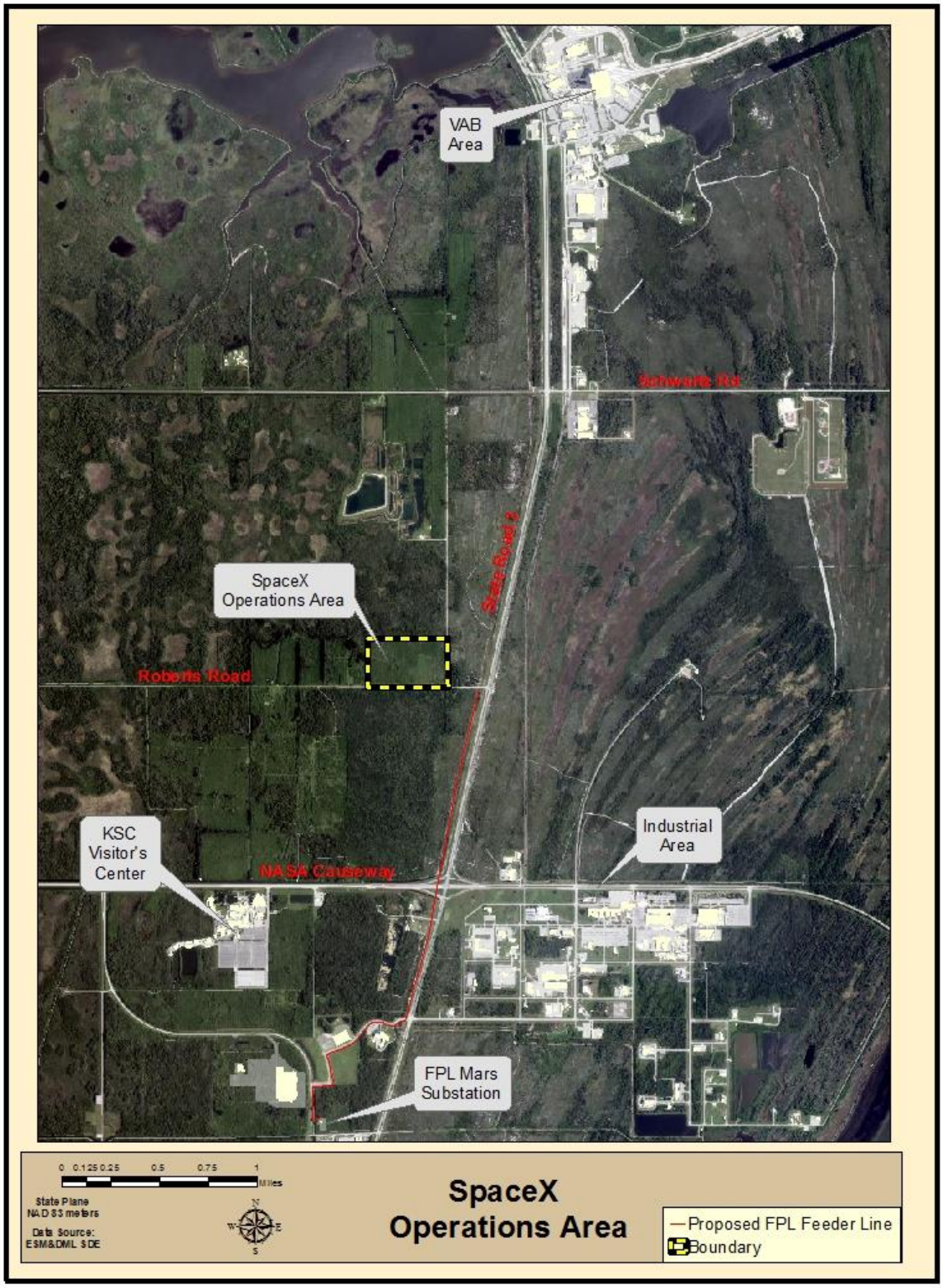

Figure 1-2. Proposed Space X KSC Operations Area along Roberts Road

1.3 Purpose and Need for Action

The purpose of the Proposed Action, development of the SpaceX Roberts Road site, is to expand SpaceX operations as needed to meet the increasing demands of its national and international commercial and government customers. This action also furthers the goals of KSC long-term planning initiatives, NASA programmatic objectives, and ultimately increases American competitiveness in commercial space. The proposed SpaceX development would be a direct fulfillment of the KSC Master Plan to "foster and support the fullest commercial use of space". The majority of launches contracted with SpaceX through 2020 are for commercial, non-government customers, thus providing for the intended diverse, multi-user KSC spaceport. SpaceX has a solid commercial manifest, ensuring that the Proposed Action is realistic and feasible.

SpaceX has a broad customer base and diverse sources of committed revenue. There are over 70 missions on its manifest from commercial and government customers in the U.S. and countries around the world, representing more than $10 billion under contract. Commercial customers include leading satellite operators such as Société Européenne des Satellites and Iridium; government customers include NASA, USAF, the National Reconnaissance Office (NRO), and a number of foreign governments. In the 2013 to 2018 time period, SpaceX launches represent more than 94% of the commercial geosynchronous transfer orbit (GTO) communications satellite missions awarded to U.S. providers. The Proposed Action is necessary to support the growing Falcon 9 and Falcon Heavy launch manifest at LC-39A and LC-40. In addition, the Proposed Action is needed to facilitate a shift in operations to support both cargo and crew missions to the ISS, as well as a handful of deep space missions from the east coast of the U.S. As established by the Office of the President and directed by Congress, it is NASA's mission to expand commercial uses of space and the space industry. This directive is detailed in the NASA Authorization Act of 2010 and the Space Act of 1958, as amended.

The purpose of the Proposed Action from NASA's perspective is to expand its spaceport capabilities to: enable improved access to KSC's space launch and test operation capabilities by commercial and other non-NASA users; advance NASA's mission by fostering a commercial space launch and services industry; and improve the return on taxpayer investment of KSC spaceport facilities through expanded and improved utilization. In support of these goals, NASA's action is to develop and implement an EUL for the Roberts Road property. 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.

1.4 Structure and Scope of the Environmental Assessment

This EA presents the analysis and description of potential environmental impacts that could result from the Proposed Action and the 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.

The structure of the EA is as follows: Section 2 describes the Proposed Action, the No Action Alternative, and Alternatives Considered but Eliminated from Analysis, and discusses standards for alternative selection or non-selection. Section 3 describes the affected environmental resources and potential direct and indirect effects (consequences) of the Proposed Action and the No Action.

The resources analyzed in detail are:

- Land Use/Visual Resources
- Noise
- Biological Resources
- Cultural Resources
- Air Quality
- Climate
- Hazardous Materials/Hazardous Waste
- Water Resources
- Geology and Soils
- Transportation
- Utilities
- Health and Safety
- Socioeconomics
- Environmental Justice

Section 4 describes cumulative impacts on the resource areas from other similar past, present, and reasonably foreseeable future actions. Section 5 presents a list of those who prepared the EA and key personnel who contributed to its preparation. Section 6 lists references cited in the EA.

2.0 DESCRIPTION OF THE PROPOSED ACTION

2.1 Introduction and Background

This section provides a discussion of the Proposed Action, the SpaceX Roberts Road development on KSC including a launch and landing control center, booster and fairing processing and storage facility, a rocket garden, a security office and a utilities yard. It also provides descriptions of alternatives considered but eliminated. The Proposed Action and the No Action Alternative are evaluated.

2.2 Description of Proposed Action

SpaceX plans to develop the Roberts Road site to support the growing Falcon 9 and Falcon Heavy launch manifest at LC-39A and LC-40. The proposed development would be located on Roberts Road (Figure 1-2) to include the abovementioned facilities which are further described in the following paragraphs. The conceptual site plan is provided at the end of Section 2 (Figure 2-1). SpaceX is using abandoned facilities on CCAFS referred to as Area 59, for all planned Dragon processing operations. Area 59 was formerly used by the USAF for satellite processing.

Additional facilities may be required in the future to support the launch manifest or new launch vehicle specifications. The scope of prospective actions has not yet been defined and future facilities are not in planned development at this time.

Launch and Landing Control Center

The launch and landing control center would be of sufficient size to host a data center; firing room; engineering room; control center for Falcon 9, Falcon Heavy and Dragon; customer control center; temporary customer offices; and indoor and outdoor meeting space. The launch control center is envisioned to be world-class, architecturally distinctive, and equipped for satellite, cargo, and crew missions (Figure 2-2). In addition to hosting remote launch operations to prepare Falcon launch vehicles for flight, the center would provide customer accommodations, including administrative space for senior executives on launch day, meeting space, technical control rooms, management rooms, and viewing accommodations for customers. The launch and landing control center would occupy an approximate footprint of 2,973 m^2 (32,000 ft^2) with the maximum height of the building not to exceed 92 m (300 ft). The facility would also include an adjacent parking facility for up to 200 vehicles, with access via paved roads.

Booster and Fairing Processing and Storage Facility

With SpaceX plans to refurbish and reuse Falcon vehicles to support manifest rate, an additional vehicle processing and storage facility is required. A graphic of a notional Falcon hangar is provided in Figure 2-3. This facility would require a footprint of 12,356 m^2 (133,000 ft^2) with a height not to exceed 31 m (100 ft). It is assumed that approximately 8,175 m^2 (88,000 ft^2) be utilized for booster processing and storage, while approximately 4,181 m^2 (45,000 ft^2) be utilized for fairing processing and storage. It is possible that these two functions may be split into two unique facilities if beneficial for operations.

Future plans may include development of a connected facility for end-of-line rockets to allow for decommissioning of parts and hardware investigation. This facility would have a footprint not to exceed 2,973 m^2 (32,000 ft^2). Further, if flight hardware storage requires expansion, an additional facility would be built on the site with a footprint of up to 9,290 m^2 (100,000 ft^2).

Rocket Garden

SpaceX will incorporate a location to display historic space vehicles (referred to as a rocket garden) within this development. These vehicles may include Dragon and Falcon 9 staged vertically or horizontally. All vehicles will be completely inert, with no hazardous material present on the interior or exterior of the system. The display may accommodate up to several Dragon and Falcon 9 vehicles.

Security Office

To help monitor the site and provide a centralized security hub, SpaceX proposes a security office of 232 m^2 (2,500 ft^2) near the main entrance off of Roberts Road.

Utilities Yard

Additional utilities would be required to support the proposed facilities. Utilities including fiber communications, domestic wastewater, potable water, and gas would be run from State Road (SR) 3 and tie in to the northeast corner of the property. The 26,013 m^2 (280,000 ft^2) utilities yard would be located at the northeast corner of the property and enable utilities support for the entire site. The centralized water-chilled HVAC system would consist of water tanks, cooling towers and pumps housed at the utilities yard. Water lines will be run from each facility to the yard most likely along internal roads. Alternately, air-chilled HVAC units would be utilized on a per facility basis.

A wastewater lift station would be installed to support flow rate to the entire site. If additional wastewater capability is required, SpaceX would work with NASA on enhancements to the domestic wastewater collection/transmission system. In the rare, unanticipated case that a wastewater treatment plant would be required, one could be built in the utilities yard.

If needed, SpaceX would work with FPL to develop a new substation to be housed at the utilities yard on site or at a location off site. FPL and KSC would define the appropriate location and perform necessary environmental evaluations. Prior to completion of a new substation SpaceX would potentially utilize the Mars substation located near Exploration Park, with temporary generator support for redundancy. FPL is planning to install 3 to 6 inch conduits housing two distribution feeders, from outside the Mars substation extending to just south of Roberts Road (Figure 1-2). The route will go through Exploration Park along existing road right-of-ways before turning north within an existing FPL transmission easement. The FPL feeder line would eventually run along Roberts Road into the proposed SpaceX Operations Area.

Road improvements would include paving Roberts Road and A Avenue to support two lanes along the length of the site and adding a left turn lane capability on SR 3. Internal site roads would provide access to facilities within the site boundary. As SpaceX develops new vehicles, Roberts Road could be expanded to provide four-lane capability, if needed. A parking lot south of the utilities yard is tentatively proposed and would provide parking for up to 300 cars.

SpaceX would also connect to the existing fiber communications line and gaseous nitrogen pipeline along SR 3. A helium pipeline does not currently exist along SR 3 but SpaceX would connect to one if it becomes available in the future.

2.3 Proposed Action Alternatives

The following project alternatives are being evaluated for purposes of establishing booster and fairing processing and storage, and a launch and landing control center on the east coast. The Proposed Action and No Action Alternatives (Section 2.5) were identified and carried forward for further evaluation. Several

other alternatives, described in Section 2.4, were eliminated due to increased hazard risks to KSC personnel, greater adverse environmental impacts, or inability to meet other site selection standards, such as line of sight requirements.

The Roberts Road Development site is isolated from other NASA facilities and operations eliminating issues with quantity distances (QDs) and buffers (Figure 2-3). There is easy access to SR 3 and infrastructure including water, sewer, electric, and gas distribution. The site is abandoned and was previously comprised of citrus groves. A land use change from Renewable Energy to Assembly, Testing and Processing would be required for this site development. A site plan would need to be submitted for the land use change request to be vetted through the Master Plan Amendment Process.

2.4 Alternatives Considered and Eliminated from Further Consideration

Title 32 CFR 989.8 discusses the analysis of alternatives. An EA must include an analysis of reasonable alternatives to the Proposed Action and the No Action Alternative. Reasonable alternatives are those that meet the underlying purpose and need for the Proposed Action. Alternatives may be eliminated from detailed analysis based on selection standards. They must also support the stated purpose and need discussed in Section 1. Considerations for the SpaceX Roberts Road development include:

- QD requirement of 381 m (1,250 ft) to reduce operational conflicts
- Proximity to existing NASA facilities and infrastructure
- Driving distance to LC-39A
- Infrastructure requirements and availability
- Outside of existing hazardous clear areas
- Line of sight to LC-39A and LC-40
- Compatibility with KSC Master Plan

Additional areas evaluated for the SpaceX development site are discussed below and depicted in Figure 2-4.

2.4.1 Schwartz Road

This location would require a new access road extending north from Schwartz Road. The site conforms to the KSC Master Plan but could potentially limit future operations and development outlined in the Master Plan from occurring in this area when the 381 m (1250 ft) QD is taken into consideration. Infrastructure upgrades at this site would be costlier due to its farther distance from existing utilities along SR 3.

2.4.2 HMF Area

Land use of this area is already designated Assembly, Testing, and Processing. However, of the sites considered, the Hypergol Maintenance Facility (HMF) area is the greatest distance from LC-39A. In addition, the QD of 381 m (1,250 ft) would encroach upon occupied facilities M7-1059 and M7-1357.

2.4.3 Fluid Services Road

Additional infrastructure construction would be required for this site. Line of sight constraints between the Launch Control Center and LC-39B are present at the Fluid Services Road site. NASA may eventually need this area for future programmatic needs and/or to combat climate change impacts, given its proximity to the Vehicle Assembly Building (VAB) and other program assets. This location creates risks to hazardous

NASA activities at LC-39B and the Ordnance Storage Facility. Blast Danger Areas of LC-39B and Ordnance Storage Area QD could potentially encumber a nearby processing facility.

2.4.4 SLF Area

The SLF area land use designations are Horizontal Launch and Landing, and Conservation/Operational Buffer. The SpaceX development would encroach upon future SLF development. Also, KSC Master Planning will not site two conflicting uses by separate entities in such close proximity.

2.4.5 Other

Various sites and facilities not located on KSC were also considered for the proposed project. None of these alternatives were determined to meet the stated purpose and need for the proposed project.

2.5 Description of the No Action Alternative

The No Action Alternative would mean there would be no EUL between NASA and SpaceX and a SpaceX development on KSC would not be built. SpaceX booster and fairing processing would take place off site at another east coast location and additional facilities needed to support cargo and crew missions to the ISS, along with deep space missions, would be constructed elsewhere. This could result in longer turnaround times between launches. There would be less diversity in use of KSC property and fewer commercial customers for whom the majority of SpaceX contracted launches through 2020 are planned.

Figure 2-1. SpaceX KSC Operations Area on Roberts Road Conceptual Site Plan

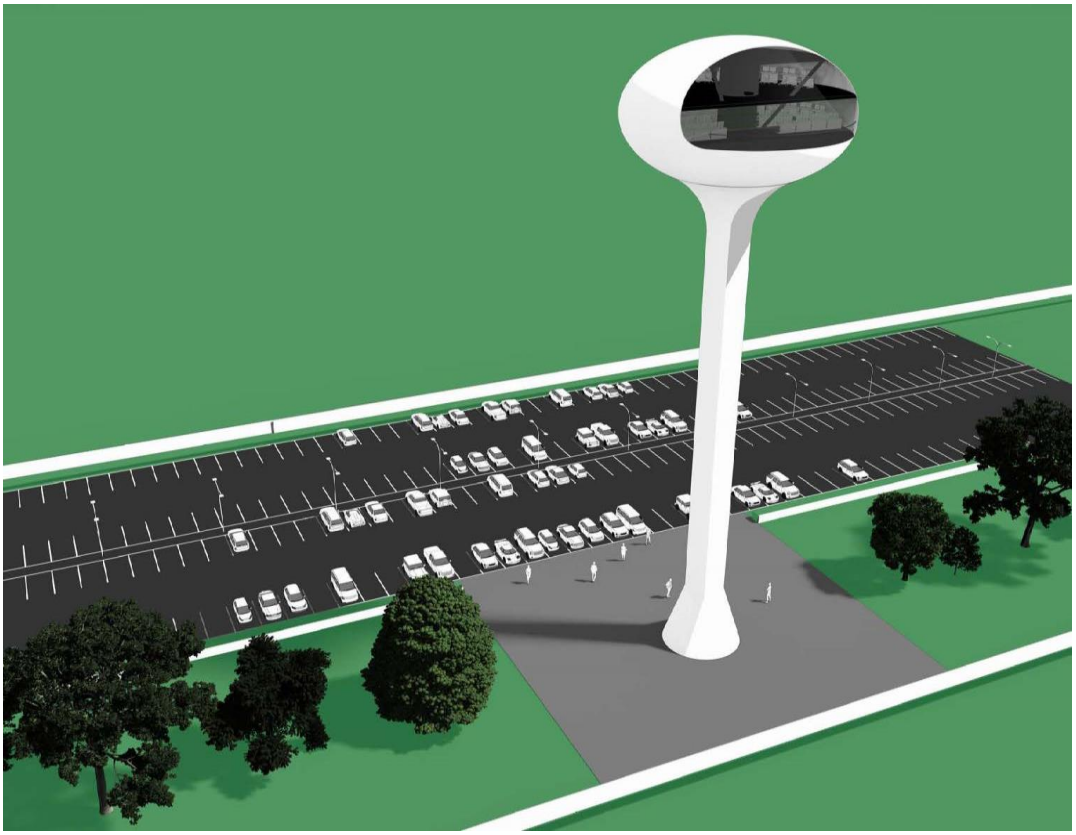

Figure 2-2. Graphic Rendering of the Proposed Launch and Landing Control Center

Figure 2-3. Conceptual SpaceX Hangar for Falcon Maintenance and Storage

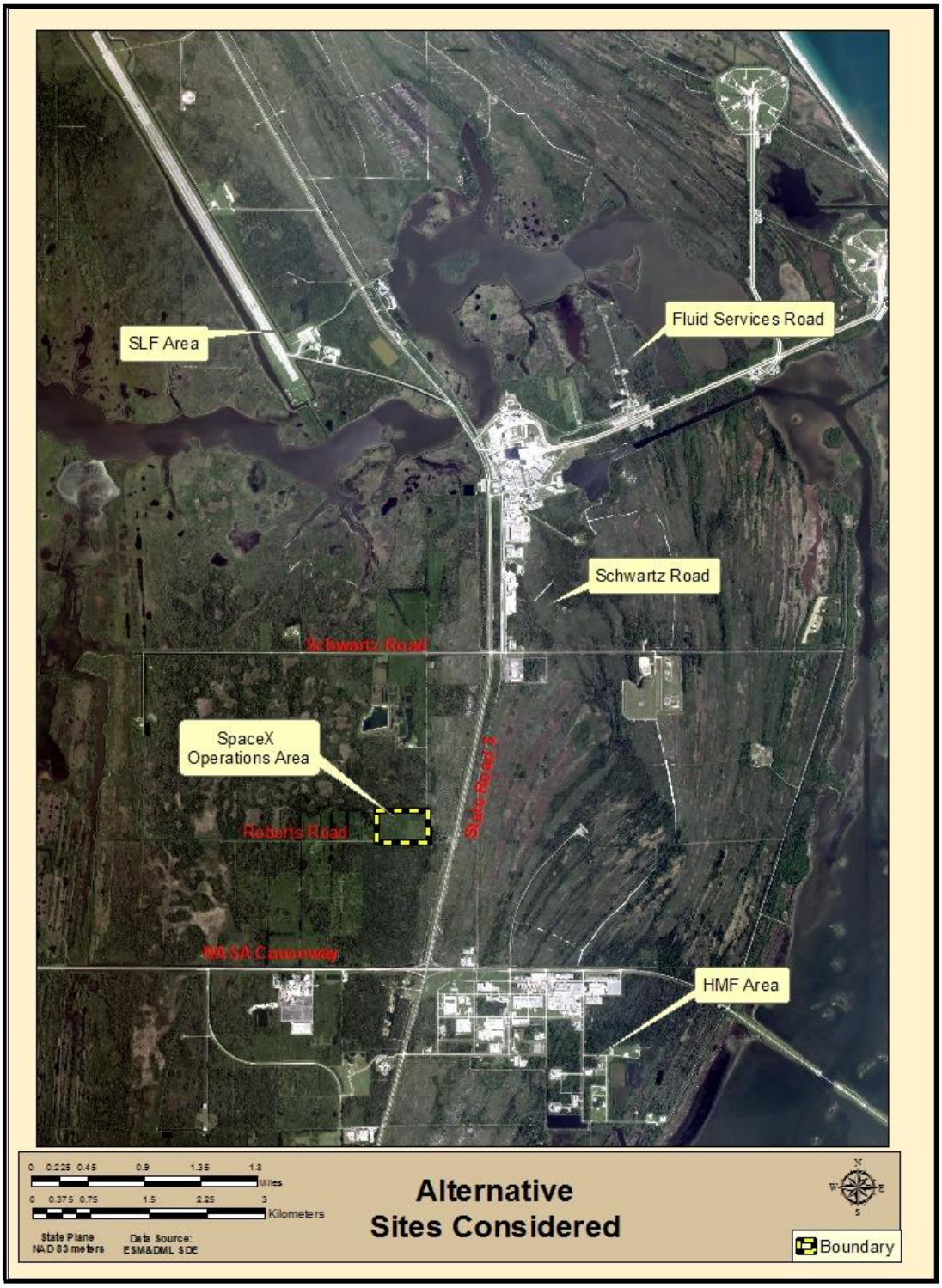

Figure 2-4. Additional KSC Sites Considered for the SpaceX Operations Area.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter 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. As directed by NEPA, CEQ regulations on implementing NEPA (40 CFR 1500-1508), NASA's regulations for implementing NEPA (14 CFR 1216), and NASA NEPA management requirements (NPR 8580.1A), the description of the affected environment focuses on those resource areas potentially subject to impacts. Therefore, the level of detail used in describing a resource is in accordance with the anticipated level of environmental impact. The analysis in this EA considers the current conditions of the affected environment and compares those to conditions that might occur should SpaceX implement any of the alternatives. The affected environment for this EA includes the geographic extent of the land encompassed by the proposed SpaceX Roberts Road development. The following parameters are used to evaluate the duration and extent of potential impacts associated with the Proposed Action and alternatives:

- ***Short term or long term.*** These characteristics are determined on a case-by-case basis and do not refer to any stringent time period. Generally, short-term effects occur only with respect to a particular activity or for a finite period, such as the time required for construction. Long-term effects are more likely to be persistent and chronic.
- ***Direct or indirect.*** A direct effect is caused by and occurs contemporaneously at or near the location of the action. An indirect effect is caused by a proposed action and might occur later in time or be farther removed in distance but still be a reasonably foreseeable outcome of the action.
- ***None, minimal, moderate, or major.*** These relative terms are used to characterize the magnitude or intensity of an impact. The term "none" would be used when there are no impacts expected. Minimal effects are not expected to be measurable, or are too small to cause any discernable degradation to the environment. A moderate impact would be measurable, but not substantial, because the impacted system is capable of absorbing the change, or the impacts could be managed through conservation measures and mitigation. A major effect could be substantial either individually or cumulatively.
- ***Adverse or beneficial.*** An adverse effect is one having unfavorable or undesirable outcomes on the man-made or natural environment. A beneficial effect is one having positive outcomes on the man-made or natural environment. A single act might result in adverse effects on one environmental resource and beneficial effects on another resource or could result in both adverse and beneficial impacts on a single resource.

This EA examines the environmental impacts of the Proposed Action and No Action alternatives on the following resource areas: land use, visual resources, coastal zone management, noise, biological resources, cultural resources, air quality, climate, hazardous materials and wastes, water resources, geological resources, transportation, utilities, health and safety, socioeconomics, and environmental justice.

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 2015 ERD for KSC (NASA 2015a). The 2015 ERD can be accessed at https://environmental.ksc.nasa.gov/projects/documents/ERDrevF.pdf. Information on the resources evaluated in this EA are well described in the recent KSC PEIS (NASA 2016).

3.1 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 bound by NASA land use regulations. 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.

3.1.1 Affected Environment

Detailed discussions of land use at KSC are available in the KSC PEIS and the KSC ERD, (NASA 2016, NASA 2015a). A summary is provided in the following paragraphs.

Land Use

Land and open water resources of KSC comprise 57,400 ha (142,000 ac) in Brevard County and Volusia County, and are located along the east coast of central Florida at approximately 28° 38'N, -80°42'W. The majority of the KSC land areas are located on the northern part of Merritt Island, which forms a barrier island complex adjacent to Cape Canaveral. Undeveloped areas (uplands, wetlands, mosquito control impoundments, and open water) comprise approximately 95% of KSC. Nearly 40% are open water areas of the Indian River Lagoon system (IRL), including portions of the Indian River, Banana River, Mosquito Lagoon, and all of Banana Creek (NASA 2015a).

KSC was established under NASA jurisdiction for the purpose of implementing the Nation's space program (National Space Act 1959). NASA maintains operational control over approximately 1,787 ha (4,415 ac) of KSC (NASA 2015a). These are the operational areas, which are dedicated to NASA ground processing, launch, and landing activities, and include facilities and associated infrastructure such as roads, parking areas, and maintained right-of-ways. Undeveloped lands within the operational areas are dedicated safety zones or are reserved for planned and future expansion.

The overall land use and management objectives at KSC are to maintain the Nation's space mission operations while supporting alternative land uses that are in the Nation's best interest. KSC land use is carefully planned and managed to provide required support for missions while maximizing protection of the environment. Land planning and management responsibilities for areas not directly utilized for NASA operations have been delegated to the USFWS at Merritt Island National Wildlife Refuge (MINWR) and the National Park Service (NPS) at Canaveral National Seashore (CNS). The 54,723 ha (135,225 ac) outside of NASA operational control are managed by the NPS and the USFWS. The NPS administers a 2,693 ha (6,655 ac) area of the CNS, while the USFWS administers the remaining 52,030 ha (128,570 ac) of the CNS and the MINWR (NASA 2015a). This unique relationship between space flight and protection of natural resources is carefully orchestrated to ensure that both objectives are achieved with minimal conflict.

The Refuge was created in 1963 by agreement between the Bureau of Sport Fisheries and Wildlife (later USFWS) and NASA to manage the undeveloped lands needed as a safety buffer around KSC. KSC has an agreement with the U.S. Department of the Interior for management of a part of the CNS by the NPS and a part by the USFWS. According to an Interagency Agreement between NASA and USFWS for Use and Management of Property at KSC known as MINWR (KCA-1649 Rev. B) the USFWS shall conduct habitat

management activities, including prescribed burning. The USFWS shall coordinate prescribed burns on MINWR in accordance with the "Joint Operating Procedure between the 45th Space Wing, USFWS, and KSC for Prescribed Burning on the MINWR, KSC, and Cape Canaveral Air Force Station, Florida," KCA-4205, Rev. B.

Fire managers at MINWR have been conducting prescribed fire and wildfire control operations in smoke sensitive areas of KSC and CCAFS for over 35 years. KSC facilities are intermixed with fire-dependent wildland habitats including oak-palmetto scrub, pine flatwoods, and marshlands. Due to the high occurrence of lightning strikes, wildfires will continue to occur on MINWR. These wildfires can be managed but not eliminated. Unplanned wildfires pose a risk to public health and safety and interfere with spaceflight operations.

Prescribed burning is the intentional ignition of grass, shrub, or forest fuels for specific purposes. Burn programs on CCAFS and KSC are used as an important natural resource and land management tool and provide biological, ecological, environmental, and safety benefits. Prescribed burns are conducted to enhance and restore wildlife habitats to prefire exclusion conditions, to promote and benefit wildlife species that are dependent on fire adapted ecosystems, to aid the control of exotic plants and vegetation or "hazardous fuel loads" to reduce wildfire threat and protect critical spaceflight infrastructure on CCAFS and KSC.

The Roberts Road location is within Fire Management Unit (FMU) 6.3. In July 2017, lightning caused a wildfire on the west side of the unit burning over 2,469 ha (6,100 ac). As described above, the USFWS attempts to manage wildfire threats through planned prescribed burn ignitions.

The future land use plan for KSC promotes the best and most efficient use of land area resources balanced with an understanding of development suitability and capacity. The Master Plan outlines a development framework that would support the growth of the multi-user spaceport model. KSC devised eighteen land use categories to describe regions within which various types of operational or support activities are conducted (NASA 2016). Table 3-1 lists existing and future acreages for designated land use at KSC.

Table 3-1. Existing and Proposed Future Land Uses at KSC.

Land Use	Existing Acreage	Future Acreage	Change Acreage[1]
Administration	104.76	40.72	-64.03
Assembly, Testing and Processing	475.41	1,894.77	1,419.36
Central Campus	NA[2]	138.75	138.75
Horizontal Launch and Landing	501.25	1,806.62	1,305.37
Launch Operations and Support	398.75	491.59	92.84
Open Space	1,873.64	NA	-1,873.64
Operational Buffer/Conservation	44,583.14	41,297.17	-3,285.97
Operational Buffer/Public Use	34,844.14	34,824.72	-19.42
Public Outreach	216.01	522.13	306.12
Recreation	161.36	161.36	0.00
Renewable Energy	66.54	1,109.85	1,043.31
Research and Development	88.36	867.49	779.13
Seaport	30.92	30.92	0

Support Services	723.91	471.40	-252.51
Utility Systems	1,327.23	1,329.60	2.37
Vertical Launch	360.32	728.08	367.76
Vertical Landing	NA	40.56	40.56
Water	55,541.81	55,541.81	0.00
Total	**141,297.54**	**141,297.54**	0.00

[1]Total difference in size between current land use and future land use for each category; numbers in red represent a future land use amount that would be smaller than the current amount for the category; numbers in green signify a future land use amount that would be larger than the current amount for the category. [2]Not Applicable. Source: NASA 2016.

The Roberts Road location is currently designated Renewable Energy to accommodate varying forms of naturally replenished energy applications. The location is currently fallow agricultural land. This land use type is also identified for research and production facilitating the KSC goal of achieving increased on-site generation of its power from renewable sources. No facilities or associated infrastructure have been historically located here.

Visual Resources

The area of consideration for visual resources includes the viewshed around the Proposed Action site such as adjacent lands at and surrounding KSC within view of facilities, such as off-station lands within safety clear zones. Visual resources are any naturally occurring or man-made feature that contributes to the aesthetic value of an area. Areas such as coastlines, national parks, and recreation or wilderness areas are usually considered to have high visual sensitivity.

NASA considers the extent to which any lighting or other visual impacts associated with an action would create an annoyance among people in the vicinity or interfere with their normal activities. Visual and aesthetic resources refer to natural or developed landscapes that provide information for an individual to develop their perceptions of the area. The existing conditions at KSC are characterized as having low visual sensitivity, because the site is currently an industrialized area that supports rocket launches. Notable visual structures include the lightning protection towers at LC-39B. Due to the flat topography and the height of the lightning towers (approximately 161 m [528 ft]), the lightning protection towers can be seen several miles away. Other highly visible structures include the VAB and the Visitor Complex Space Shuttle Atlantis External Tank and Solid Rocket Booster Display.

The visual resources at KSC are typical of an administrative and industrial campus. The LC-39 area is characterized by launch vehicle assembly, testing and processing facilities while the Industrial Area includes various administrative, payload and launch vehicle processing, and research facilities. Specialized development at KSC includes the SLF and associated hangars and fueling facility, LC-39A and LC-39B.

Undeveloped areas on KSC (approximately 54,592 ha [134,900 ac]) are comprised of expanses of saltmarsh and freshwater wetlands, impounded areas, hardwood hammocks, scrub oak, pine flatwoods, and open water areas. Nearly 40% of KSC consists of open water areas of the IRL system (NASA 2015a).

Existing light sources at KSC include nighttime security lighting at the launch complexes and buildings. NASA has guidelines to address the light impacts to wildlife species under the KSC exterior lighting requirements in Chapter 24 of Kennedy NASA Procedural Requirements (KNPR) 8500.1 Rev. E (NASA 2018). The installation and use of any lighting that is visible from the exterior of a facility must be in

compliance with these guidelines. Development of a Lighting Operations Manual that meets the exterior lighting requirements is mandatory for all new structures. The Biological Opinion (FWS Log No. 04EF-1000-2016-F-0083) for exterior light use addresses incidental take of emergent and nesting adult sea turtles and establishes actions to minimize adverse impacts of artificial lighting to sea turtle reproductive success on KSC beaches.

Coastal Zone

Federal activity in a coastal zone requires preparation of a Coastal Zone Consistency Determination in accordance with the Coastal Zone Management Act (CZMA) of 1972 as implemented by NOAA through State coastal zone management offices. Any activities, which directly affect the State's coastal zone are subject to a determination of consistency with the State's Coastal Management Program (15 CFR 930.30-44). NASA, USAF, and other federal agencies are required to review their activities with regard to direct effects on the coastal zone and are responsible for making the final coastal zone consistency determinations. Florida's statewide coastal management program, executed by the Florida Department of Environmental Protection (FDEP), oversees activities occurring in or affecting the coastal zone and is based on a network of agencies implementing 24 statutes protecting coastal resources. The State of Florida's coastal zone is the area encompassed by the entire state and its territorial seas.

The CZMA provides for management of our Nation's coastal uses and resources. CZMA encourages coastal states to develop and implement comprehensive management programs that balance the need for coastal resource protection with the need for economic growth and development in the coastal zone. Once a management program is developed and approved by the National Oceanic and Atmospheric Administration (NOAA), the state is authorized to review certain federal activities affecting the land or water uses or natural resources of its coastal zone for consistency with the program. This authority is referred to as "federal consistency". The Florida Coastal Management Program was approved by NOAA in 1981 and is codified in Chapter 380, Part II, Florida Statute (F.S.).

Federal activities at KSC which are likely to require consistency determinations include:

- Any project subject to state or federal dredge and fill permitting review
- Point or new non-point source discharge to surface waters
- Major industrial expansion or development projects

The review of consistency with the Coastal Zone Management Program is coordinated through the Florida State Clearinghouse. Because any federal action, which directly affects the coastal zone would also be subject to NEPA, consistency review is typically addressed in the NEPA documentation which is submitted to the Clearinghouse for review.

3.1.2 Environmental Consequences

The following describes potential impacts of the Proposed Action and No Action Alternative on land use, visual resources and coastal zone management at KSC.

Land Use/Visual Resources

The Proposed Action would require a land use change from Renewable Energy to Assembly, Testing and Processing which includes facilities operations, and land areas that are essential to space vehicle component assembly, integration and processing prior to launch. Laboratories; material support and interface testing to achieve final assembly; test and closeout to prepare and test payloads; space systems; and systems

components for flight and integration which may include hazardous commodities are also included in this classification.

This site is not currently a NASA operational area but is managed by USFWS and would have to be removed from MINWR oversight. Once removed from MINWR oversight, these lands would no longer be available for controlled burning operations. The fire management program administered by the MINWR controls vegetative fuel loads at KSC to reduce the potential of wildfires. When NASA KSC receives USFWS notification of a planned prescribed burn adjacent to the Roberts Road property, NASA KSC shall notify SpaceX within a reasonable amount of time to allow coordination of prescribed burn with SpaceX. NASA KSC management will assist the USFWS in resolving any operational or other barriers in order to accomplish prescribed burns. In addition, SpaceX shall clear and maintain a 30.5 m (100 ft) wide buffer around the outside of the site boundary as defensible fire space. This buffer would serve to protect SpaceX assets and to better enable USFWS management of adjacent land via prescribed burns. The change in land use designation and removal from MINWR would result in a moderate impact. A site plan will be submitted so this land use change request can be vetted through the Master Plan Amendment Process

Potential visual impacts to the landscape in the vicinity of the Proposed Action include light emissions and facilities that block the view of natural surroundings. The impact of the SpaceX Roberts Road development to visual resources would be moderate. Roberts Road is outside of the public access area with exception of Visitor Complex tour buses and visitors during launch viewing events. Though the Proposed Action would require some construction and modifications, these additions would be consistent with existing infrastructure and not cause a significant impact to the area. SpaceX would submit a site plan to NASA with 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 (LOS), safety, and security.

No Action Alternative

Under the No Action alternative there would be no new construction or reuse of existing facilities or property. Therefore, there would be no project related impacts to land use or visual resources.

Coastal Zone Management

Florida's coastal zone includes the entire state and its territorial seas. NASA has determined that the Proposed Action to allow SpaceX to develop the Roberts Road site on KSC is consistent with the Florida Coastal Management Plan and would result in no significant impact to coastal resources. As part of the CZMA determination process, this EA will be sent to the FDEP and the Florida State Clearinghouse during the public review period.

No Action Alternative

Under the No Action Alternative there would be no new construction of facilities and no additional operations related to SpaceX spacecraft processing. Therefore, there would be no additional impacts to coastal zone resources.

3.2 Noise

Noise is defined as any sound that is undesirable because it may interfere with communication, be of sufficient intensity and time to result in decreased hearing acuity, or is otherwise intrusive. Given certain intensities, frequencies, and duration, noise can change the behavior of humans and wildlife. Noise is often

generated by activities essential to a community's quality of life, such as construction or vehicular traffic. Noise is measured in decibels (dB) and an A-weighted sound pressure level (dBA) is commonly applied.

The Noise Control Act of 1972 (PL 92-574) directs federal agencies to comply with applicable federal, state, and local noise control regulations. In 1974, the Environmental Protection Agency (EPA) provided information suggesting continuous and long-term noise levels in excess of day/night average sound level 65 dBA are normally unacceptable for noise-sensitive land uses such as residences, schools, churches, and hospitals. The Brevard County Code §46-131 includes a nuisance noise ordinance which does not set specific not-to-exceed noise levels. The county noise ordinance exempts construction noise between the hours of 7:00 a.m. and 8:00 p.m. (NASA 2016).

3.2.1 Affected Environment

Background information on noise in the vicinity of the Proposed Action is well described in the recent KSC PEIS (NASA 2016) and the KSC ERD (NASA 2015a). Noise generated at KSC originates from: 1) aircraft noise, 2) industrial operations, 3) construction, 4) launches, and 5) traffic noise. Noise levels around facilities at KSC approximate those of any urban industrial area, reaching between levels of 60 to 80 dBA. KSC is a large controlled access area where the noise environment is isolated to the activities within the areas where launch vehicle and spacecraft processing and launch represent the primary mission. Aircraft, rocket launches, and landings present sound levels that extend beyond the boundaries, but only for a short duration. As described in Section 1, KSC is strategically located away from large population areas, with the closest major municipalities being the City of Titusville, approximately 15 km (9.5 mi) to the west, and the City of Cape Canaveral, approximately 14 km (8.5 mi) from the KSC Industrial Area. The sound produced by current rocket launches is noticed in all local population areas and the perimeter of KSC is commonly visited by the public for launch viewing.

Traffic noise is generated by employees traveling to and from their workplace and the local traffic movement. Road surfaces are mostly asphalt with a maximum speed limit of 89 km per hour (55 miles per hour [mph]) on the major roadways and commonly 56 km per hour (35 mph) or less on local roads. Typical noise levels from passenger vehicles, tourist buses, and heavy trucks range between 72 and 86 dBA at speeds up to 89 km per hour (55 mph) at a distance of 15 m (50 ft). Overall noise from these sources is dependent on many factors including traffic volume, speed, vehicle type, roadway geometry, and local structures. Most of the vehicular activity is during the daylight hours, commonly between 6:00 a.m. and 4:30 p.m. There are both second and third work shifts at KSC, however the population and traffic are greatly reduced during those times.

3.2.2 Environmental Consequences

Under the Proposed Action, short- and long-term minimal adverse effects would be expected. They would result in the continuation of many of the types of noise presently occurring at KSC.

Short-term increases in noise would result from the use of heavy equipment during construction and modification activities at any of the locations. Construction noise is largely limited to the site being developed, yet noise can carry to surrounding areas. Typical values for noise levels from construction and associated vehicles are described in the PEIS (NASA 2016). Construction sound levels typically range from 78 to 89 dBA at a 15 m (50 ft) distance from the source. Noise generated during construction activities of the Proposed Action or at any of the option locations would potentially have discernable, but temporary

effects on wildlife occurring nearby. Most wildlife occurring closer to noise sources would be free to move away or find shelter (e.g., burrows); therefore, the impacts would be expected to be minimal.

Long-term effects would be from the addition of stationary sources of noise such as standby generators, heavy equipment, increased traffic in areas, and daily industrial operations. A noticeable increase would occur at the Roberts Road location, as this site is currently undeveloped. The loudest noise generated by industrial activities at KSC is produced by hydraulic pumps and scrubbers operating within the confines of their enclosures. Operators are required by Occupational Safety and Health Administration (OSHA) and NASA regulations to be equipped with ear protection devices. Other intermittent raised levels of noise occur during operation of lifting equipment, diesel-powered generators, heavy-duty service vehicles, and certain sheet metal forming and cutting processes. Even the highest levels of noise from industrial activities will have minimal impact on the environment and none will affect areas beyond the KSC boundary when exposed to these levels (see Table 3-2 for typical noise sources), (NASA 2015a). There would be no impacts to typical noise levels experienced currently by communities adjacent to KSC property due to normal daily operations.

No Action Alternative

Under the No Action Alternative there would be no new facility construction or SpaceX operations. Therefore, there would be no construction or operations related impacts to noise.

Table 3-2. Typical Noise Sources and Levels

Outdoor	**Sound Level (dBA)**	**Indoor**
Construction site	100	Factory machinery
Tractor/boiler room	90	Garbage disposal
Heavy traffic	85	Hand saw
Freight train	80	Manual machine tools
Freeway traffic	70	Classroom chatter
Normal conversation	60	Sewing machine
Rainfall	50	Refrigerator
Quiet residential area	40	Library/quiet office

Sources: NASA 2016, OSHA (July 2017), and CHC (July 2017).

3.3 Biological Resources

Biological resources include vegetation, wildlife, and the habitats in which they occur. The variety of habitats found on KSC and the adjacent federal properties provides for the richest biodiversity of wildlife among federal facilities in the continental U.S. (Breininger et al. 1994). This diversity has been attributed to the location of KSC within a biogeographical transition zone, having faunal and floral assemblages derived from both temperate and tropical/subtropical biotic provinces. It is bordered on three sides by the IRL system, considered to be one of the most diverse estuarine ecosystems in the U.S. (Swain et al. 1995). Further to the west of KSC lies the St. Johns River Basin ecosystem, one of the largest freshwater marsh

systems in the state. In addition, KSC's proximity to the coast fosters an abundance of migratory birds. All of these factors contribute to the exceptional species diversity found on KSC (Breininger et al. 1994).

3.3.1 Affected Environment

Chapter 3.9.1 of the PEIS (NASA 2016) and Section 6 of the ERD (NASA 2015a) describe in detail the natural resources found on KSC, and provide a regulatory overview. A brief summary focusing on the proposed action location is provided below.

Habitats and Vegetation

In the mid-1800s, Douglas Dummitt established a thriving citrus business on KSC; ultimately 8,000 ha (20,000 ac) of citrus were cultivated. These groves were privately owned and remained active until 2008 when the leases expired and were not renewed by the USFWS. The majority of the Roberts Road location is former citrus grove, with 87% of the site classified as either grove or grove dominated by Brazilian pepper. The remaining 13% of the landcover at the proposed location is comprised of ruderal-herbaceous, freshwater scrub-shrub wetland, hardwood hammock, and dirt road (primary infrastructure) (Table 3-3). The freshwater scrub-shrub wetland is a man-made ditch that was created to help drain the citrus grove. The only intact natural habitat that would be impacted by 100% build out of the site would be the 0.3 ha (0.8 ac) of hardwood hammock.

Table 3-3. Various Habitat Types Present at the Roberts Road Site

Habitat Type	Roberts Road Development ha (ac)
Citrus	13.7 (33.9)
Citrus to Brazilian Pepper	9.8 (24.1)
Hardwood Hammock	0.3 (0.8)
Infrastructure-Primary	1.0 (2.4)
Ruderal-Herbaceous	1.4 (3.5)
Wetland Scrub-Shrub-Freshwater	0.9 (2.2)
TOTAL	**27.1 (66.9)**

Wildlife

Fish: On the SpaceX development site, the drainage ditch that runs through the center of the site had very little standing water at the time field visits were made in spring and summer of 2017. However, when water is present, several species of small fish could potentially be present (e.g., mosquitofish [*Gambusia affinis*], sailfin mollies [*Poecilia latipinna*], and flag fish [*Jordanella floridae*]). No protected or game species would be expected at the site.

Amphibians and Reptiles: Seventy-one species of amphibians and reptiles have been documented as occurring on KSC (Seigel et al. 2002, updated information 2017 [Rebecca Bolt pers. comm.]): four aquatic/semi-aquatic salamanders, 16 frogs and toads (including two introduced exotic species), one alligator, 11 turtles, 12 lizards (including three introduced exotic species), and 27 snakes. The highly

disturbed habitat at the site could provide habitat for some of the frogs and toads, lizards, and snakes, but the only amphibian or reptile species that was observed during field surveys was the exotic Cuban (or brown) anole (*Anolis sagrei*). There are two federally protected species that could potentially occur at the site, the gopher tortoise (*Gopherus polyphemus*) and eastern indigo snake (*Drymarchon couperi*). No gopher tortoise burrows were found during site visits and the soils on site are not conducive to burrowing. Indigo snakes have been documented using the habitat types present on the site and indigos may occur there. The average home range size for radiotagged male indigos in Brevard County was 202 ha (499 ac) and the average home range size for females was 76 ha (188 ac) (Breininger et al. 2011). The entire acreage that would be developed for the SpaceX Operations Area (27 ha, [67 ac]) is approximately 13% of an average home range for a single male indigo and 36% of an average home range for one female snake.

Birds: There have been 318 species of birds documented on KSC, and MINWR is considered to be one of the top 10 birding sites in the U.S. (NASA 2015a). There are 87 nesting species; some of these are year-round residents and others come to KSC specifically to nest. There are over 100 winter residents and over 100 species are classified as migratory or accidental.

The site has a small amount of hardwood hammock (< 0.5 ha [1.2 ac]) that could potentially support hawks, owls, and song birds. The wetlands present are too severely encroached by Brazilian pepper and other woody shrub species to attract wading birds or shorebirds. No protected species of birds are expected to occur at the site. An active eagles' nest is located approximately 700 m (2297 ft) northeast of the site. See eagles nest location map in the appendix. There are approximately 12 ha (30 ac) on the north and east edges of the site classified as potential "auxiliary" scrub-jay (*Aphelocoma coerulescens*) habitat. Auxiliary areas are mostly tertiary territories consisting of flatwoods with small scrub oak patches, and are considered population sinks or areas where scrub-jay mortality usually exceeds recruitment. Areas shown as "auxiliary" in the project site are an artifact of modeling outcomes based on adjacent habitat to the north and east (D. Breininger, pers. comm.). Observations made in the field confirm there is no scrub-jay habitat on the Roberts Road site. The area mapped as "auxiliary" scrub is actually abandoned citrus grove. There were also no Florida scrub-jays observed during site visits.

Mammals: There have been 29 species of mammals documented to occur on KSC, including 5 non-native species (NASA 2015a). Only two species are protected: the southeastern beach mouse (*Peromyscus polionotus niveiventris*) and the Florida manatee (*Trichechus manatus*). The SpaceX development site does not have habitat to support either species.

3.3.2 Environmental Consequences

Even if there was 100% build out of the site, the impacts would be expected to be minimal. The majority of the habitat is highly disturbed and comprised of non-native species. Loss of the small acreage of natural habitat (hardwood hammock) would not have significant impact. A potential wildlife consequence would be to eastern indigo snakes, and the loss of such a small amount of habitat is expected to have minimal impact. Based on habitat characteristics of adjacent areas there is the potential that indigos could occur near the proposed power distribution extension location within the FPL easement. If an indigo snake was observed on site during construction, all work would be halted until the snake had sufficient time to move away from the site without interference.

Gopher tortoise burrows have been observed along the FPL transmission easement. Disturbance of burrows would be avoided when possible. Moderate temporary adverse impacts to gopher tortoises, would result from trenching for new transmission lines and would be lessened by mitigation and conservation measures.

Tortoises would be removed from harm's way when temporary impacts cannot be avoided and returned to their original home range once the installation of power lines is completed.

The loss of former citrus grove dominated by Brazilian pepper will not have a direct impact on the Florida scrub-jay. The FPL transmission easement is adjacent to potential scrub-jay habitat. However, there would be no direct adverse impacts to habitat since work is limited to the maintained easement. NASA is undergoing informal consultation with the USFWS Endangered Species Office. USFWS concurrence of no direct adverse effect is provided in the appendix.

Migratory birds traveling in large flocks, particularly at night, are susceptible to striking tall buildings and towers. Most of these species are not listed as threatened or endangered but are protected under the Migratory Bird Treaty Act. It is not understood why this mortality occurs, but evidence suggests that night-migrating songbirds are either attracted to or disoriented by tower obstruction warning lighting systems, especially during overcast (i.e., low cloud ceiling), foggy, or other low visibility conditions (USFWS 2016). KSC bird strike potential is reasonably high because of its location along the Atlantic Flyway migration route. The coastline of Florida is used as a guide by birds as they travel during the fall and spring.

Current estimates for bird collisions with communication towers in the U.S. are over 6 million. The risk appears to increase with infrastructure height (USFWS, March 2018: https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds/collisions.php). The USFWS reports that strike risk increases with towers that are over 107 m (350 ft) tall, use steady burning lights, have guy wire supports, and are located in areas with frequent inclement weather patterns (i.e., storms, fog), in areas with a higher density of migrating birds, and along ridgelines where the air space impacts bird flight patterns.

The SpaceX launch and landing control center will be a very uniquely shaped building with limited windows. It is anticipated to be no more than 91 m (300 ft) tall but would be far more robust than a communication or wind tower. Mitigation to reduce bird collisions will be addressed in the final design and will comply with all FAA obstruction and marking guidelines.

No Action Alternative

Under the No Action Alternative there would be no land clearing for construction of facilities. Therefore, there would be no impacts to vegetation or wildlife and their habitat.

3.4 Cultural Resources

Cultural resources are historic assets associated with human use of an area. Properties are defined by the National Historic Preservation Act of 1966, cultural items are defined by the Native American Graves Protection and Repatriation Act of 1990, archaeological resources are defined by the Archaeological Resources Protection Act of 1979, sacred sites are defined by EO 13007, and collections and associated records are defined by 36 CFR 79. Cultural resources may include locations or landscapes, intangible traditional use sites, or physical remnants associated with past and/or present activities. Physical remnants of cultural resources are usually referred to as archaeological sites or historic properties. KSC has developed an Integrated Cultural Resource Management Plan (ICRMP) that reflects NASA's commitment to the protection of its significant cultural resources; the most recent version of the ICRMP covers the 2014-2018 time period (NASA 2014). The regulatory framework governing preservation and documentation of cultural resources on KSC can be found in the ICRMP and the PEIS (NASA 2016).

3.4.1 Affected Environment

There are no documented cultural resource sites within the boundary of the SpaceX Roberts Road development location. There are two historic areas in the general vicinity. One is located 215 m (705 ft) south of the southeast corner of the project area and is comprised of two structures that appear to have been associated with a homestead. The second is 325 m (1,066 ft) west of the southwest corner of the project area and contained six structures that were part of a large citrus grove.

3.4.2. Environmental Consequences

There are no documented historical or archaeological resources within the proposed site boundaries. No impacts are expected to any cultural resources from the Proposed Action.

No Action Alternative

Under the No Action Alternative the SpaceX development on KSC would not be built. Therefore, there would be no land disturbance resulting in impacts to cultural resources.

3.5 Air Quality

Chapter 3.6.1 of the PEIS (NASA 2016) and Section 3.1 of the ERD (NASA 2015a) describe in detail the regulatory context and regional air quality resources for, as well as provide a discussion of types and quantities of air pollutants emitted from NASA's activities on KSC. A brief synopsis is provided below.

3.5.1 Affected Environment

Air quality at KSC is regulated under Federal Clean Air Act regulations (Title 40 CFR Parts 50 through 99) and Florida Administrative Code (FAC) Chapters 62-200 through 62-299.

The U.S. EPA sets National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. The EPA identifies the following six criteria air pollutants for which NAAQS are applicable:

- carbon monoxide (CO)
- lead (Pb)
- nitrogen dioxide (NO_2)
- ozone
- particulate matter (PM10 and PM2.5)
- sulfur dioxide (SO_2)

KSC is located in Brevard County and is classified as an attainment area with NAAQS and State of Florida Standards. Table 3-4 shows state and federal ambient air quality standards.

The FDEP classifies KSC as a Title V major source for the potential to emit for the criteria pollutant nitrogen oxide (NO_x), which exceeds the Title V major source threshold of 100-tons per year of NO_x. KSC is considered a minimal source for carbon monoxide, volatile organic compounds (VOCs), particulate matter, sulfur dioxide, and lead emissions. NASA holds a Title V Air Operation Permit which governs the air emissions from those activities. The Title V Air Operation Permit provides a list of emissions units and also shows insignificant emissions units and/or activities. NASA operated air emission sources are listed on the NASA Title V Air Operation Permit.

The ambient air quality at KSC is predominantly influenced by daily operations such as vehicle traffic, utilities, fuel combustion, and standard refurbishment and maintenance operations. Other operations that

occur infrequently throughout the year, including launches and prescribed fires, also play a role in the quality of air as episodic events. Stationary point sources of air emissions typically include launch vehicle processing, fueling, and other point sources such as heating/power plants, generators, incinerators, and storage tanks. Mobile sources include support equipment, commercial transport vehicles, rocket launch vehicles, and personal motor vehicles.

Presented below is a summary of air emissions for years 2010 through 2015 for KSC (Table 3-5) of actual tons per year of the NAAQS regulated criteria pollutants and total hazardous air pollutants HAPs that are included in the current Title V Air Operating Permits.

Table 3-4. State and Federal Ambient Air Quality Standards

Pollutant	Average Time	State of Florida Standard	Federal Primary NAAQS	Federal Secondary NAAQS
Carbon Monoxide	8-hour[a] 1-hour[a]	9 ppm 35 ppm	9 ppm 35 ppm	N/A N/A
Lead	Quarterly 3-Month	1.5 µg/m^3 1.5 µg/m^3	1.5 µg/m^3 0.15 µg/m^3[b]	1.5 µg/m^3 0.15 µg/m^3
Nitrogen Dioxide	Annual 1-hour[d]	0.053 ppm 0.10 ppm	0.053 ppm 0.10 ppm	0.053 ppm 0.10 ppm
Ozone	8-hour[h] 1-hour[i]	0.075 ppm N/A	0.075 ppm 0.12 ppm	0.075 ppm 0.12 ppm
Particulate Matter (PM10)	24-hour[e]	15 µg/m^3	150 µg/m^3	150 µg/m^3
Particulate Matter (PM2.5)	Annual[f] 24-hour[g]	15 µg/m^3 N/A	15 µg/m^3 35 µg/m^3	15 µg/m^3 35 µg/m^3
Sulfur Dioxide	Annual 24-hour[a] 1-hour[j] 3-hour	0.02 ppm 0.10 ppm N/A 0.5 ppm	0.03 ppm 0.14 ppm 0.075 ppm N/A	0.5 ppm 0.14 ppm N/A 0.5 ppm

a. Not to be exceeded more than once per year. b. Final rule signed October 15, 2008. c. Annual mean. d. 98th percentile-averaged over 3 years. e. Annual 4th highest daily maximum 8-hour concentration averaged over 3 years. f. Not to be exceeded more than once per year on average over 3 years. g. Annual mean averaged over 3 years. h. 99th percentile of 1-hour daily maximum concentrations averaged over 3 years. i. EPA revoked the 1-hour ozone standard in all areas, although some areas have continuing obligations under that standard ("anti-backsliding"); the standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is <1. j. The 3-year average of 99th percentile of daily maximum 1-hour average must not exceed 75 ppb. Source: NASA 2015a.

Table 3-5. KSC History of Actual Annual Emissions (tons per year)

Pollutants	2016	2015	2014	2013	2012	2011	2010	2009
CO	3.2096	4.6154	6.1154	7.2167	9.5670	10.7669	10.3855	11.1693
HAPS	0.481	0.6206	0.4943	0.5515	0.5480	0.6607	0.5996	1.1641
NO_X	10.4829	15.3495	23.1059	24.9821	33.993	38.6850	36.8595	40.1191
PB	0	0	0	0	0	0.0001	0.0003	0.0011
PM	0.6812	1.1276	1.4463	1.6949	2.3559	2.6828	2.5457	2.8061
PM10	0.678	1.0763	1.4439	1.6915	2.3481	2.6700	2.5553	2.8039
PM2.5	0.5291	0.8618	1.2542	1.4439	2.0544	2.3469	2.2346	2.4868
SO_2	0.0136	0.0185	0.0220	0.0270	0.4398	0.5186	0.4921	0.5011
VOC	4.5823	4.7177	3.5612	4.3651	4.6821	6.2833	10.6881	11.1645

Source: FDEP 2017

3.5.2 Environmental Consequences

This section describes the potential impacts to air quality resulting from the Proposed Action and the No Action Alternative. Environmental consequences on local and regional air quality are determined based on changes in regulated air pollutant emissions, and upon existing air quality. A significant impact on air quality would occur if the action would cause pollutant concentrations to exceed one or more of the NAAQS or state air quality standards within Brevard County. The PEIS determined the proposed action of KSC transitioning into a multi-user spaceport would have short- and long-term minor adverse effects on air quality. No additional evaluation under tiered NEPA would be required unless the project met certain criteria (Section 3.6.2.1.5 of PEIS, NASA 2016).

Impacts to air quality from construction of the proposed action at would be minimal and of short duration. In the immediate vicinity of the site, dust from the removal of vegetation and exposure of topsoil and exhaust from heavy machinery would temporarily decrease the local air quality. Air pollutants generated could include PM10, sulfur and nitrogen oxides, and others. These materials would quickly dissipate and the air quality would return to the average ambient levels found at each location. Particulates and fugitive dust could be controlled with periodic water spraying. Temporary increases in local vehicle use, construction and land clearing equipment would be insignificant and not adversely impact the existing NAAQS. These fugitive emissions would not be substantial enough to change NAAQS attainment status.

There would also be short term increases in regulated air pollutants from possible burning of cleared vegetation at the site. The use of controlled burns to dispose of ground cover from land clearing activities is a common practice in Florida. Burning debris emits smoke and ash into the air, reducing air quality. Open burning is a regulated activity and requires authorization from the Florida Division of Forestry and a burn permit from the KSC Duty Office. Burning vegetative debris on KSC requires strict adherence to specific procedures, restrictions, and criteria to be followed during the burning activities. On a regional scale, construction-related air quality impacts are expected to be negligible for the Proposed Action activities.

Impacts to air quality from operations conducted at the Proposed Action site is also expected to be minimal and of short duration. Typical activities at the space vehicle processing facilities could include cleaning, vehicle preparation, and testing. Various cleaning solvents, including isopropyl alcohol (IPA) would be used before and after vehicle preparation. IPA is not a listed or regulated hazardous air pollutant due to its low toxicity and flammability characteristics. KSC's Title V Air Operation Permit identifies general chemical and solvent use as an insignificant emission source.

Because the exact types and quantities of exhaust-generating devices for the Proposed Action are not known, reasonably foreseeable air quality impacts from boilers, hot water generators, and backup electric generators, and non-toxic substances often associated with ground processing activities are addressed here. The capacities for typical operations of the size proposed at all of the Proposed Action site locations are estimated to be small, have low fuel usage, and are not expected to produce emissions above potential to emit threshold levels established as major sources of pollution listed in Chapter 62-213.430 F.A.C.. For that reason, the emissions are estimated to have minimal air quality impacts. SpaceX would be required to meet all federal, state, and local air quality requirements, and would apply for their own Title V operating permits if expected to have any regulated air pollution sources, operations, or processes.

The increase of emissions related to traffic associated with the SpaceX Roberts Road site facilities operations would be negligible. The addition of workforce expected for the Proposed Action could increase

traffic emissions. However, this increase would not exceed emissions that were associated with previous traffic volume, prior to the end of the Space Shuttle Program.

No Action Alternative

Under the No Action Alternative there would be no construction of new facilities or operations related to spacecraft and satellite processing occurring at the Proposed Action sites. Therefore, there would be no impacts to Air Quality.

3.6 Climate

3.6.1 Affected Environment

Climatic conditions in the east-central Florida area are influenced by latitude and proximity to the Atlantic Ocean and the IRL system. The climate is characterized as subtropical, with summer conditions predominating for nine months of the year. Average temperatures in the summer range between 21° Celsius (C) and 32°C (70° Fahrenheit [F] and 90°F). Winter months are January through March with average temperatures between 4.5°C and 24°C (40°F and 75°F). Detailed climate information can be found in the KSC ERD (NASA 2015a).

Climate Change and Sea Level Rise

Solar irradiance, the greenhouse effect, and earth's reflectivity are the key factors interacting to maintain temperatures on Earth within critical limits. Relatively recent changes in greenhouse gas concentrations (primarily carbon dioxide [CO_2]) have been identified as the principal factor influencing Earth's current climate trends (EPA 2009). Human land use changes and burning of fossil fuels for energy are the major contributors to increases in greenhouse gases that are accelerating the rate of climate change. Impacts include warmer temperatures, rising sea levels, changes in rainfall patterns, and a host of other associated and often interrelated effects. For the KSC region, the average air temperature for the 30-year climate baseline period is 22° C (72° F) (NASA 2015). Climate forecasts indicate that average temperatures will increase by as much as 3.3°C (6°F) during the latter part of the century. Other anticipated impacts are described in the KSC Shoreline Protection EA (NASA 2015). Emissions of CO_2 at KSC are primarily associated with vehicle traffic, ground support operations, and launch events. On KSC, CO_2 emissions in 2016 were estimated at 99,025.2 metric tons (mt), equaling a 54% reduction in sources controlled by the government and a 32% reduction from non-government sources from 2008 baseline emission statistics (NASA 2016a).

During the last two decades, erosion along the KSC coastline has increased as a result of frequent storm surges from nor'easters, tropical storms, and hurricanes. Erosion may have been exacerbated by effects from rising sea-levels which have exceeded 12.7 centimeters (cm) (5 inches [in]) in the last 20 years, as measured at the Trident Pier in the adjacent Port Canaveral. As a result, the area has been categorized as "critically eroded" by the FDEP (FDEP 2016). Over 1.8 km (1.0 mi) of artificial dune have been created along the KSC coastline to protect space program assets and important wildlife habitat (NASA 2015); an additional 9.2 km (5.7 mi) of dune creation is being planned for 2018/2019.

3.6.2 Environmental Consequences

In February 2010, the CEQ issued NEPA guidance for considering the effects of climate change and greenhouse gas emissions. Specifically, if a proposed action would be reasonably anticipated to cause direct emissions of 25,000 mt or more on an annual basis, agencies should consider this an indicator that a

quantitative and qualitative assessment may be meaningful to decision makers and the public (CEQ Memorandum 18 February 2010). Based on the anticipated addition of 70 employees and the benign activities that would occur at the facilities, annual direct emissions should be well under 25,000 mt. Therefore, the impact of this project to global or regional climate change, including sea level rise, is anticipated to be minimal.

No Action Alternative

Under the No Action Alternative, there would be no new construction or spacecraft processing taking place for SpaceX on Roberts Road. Therefore, there would be no greenhouse emissions resulting in climate change impacts.

3.7 Hazardous Materials/Hazardous Waste

A hazardous material is any 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 through interaction with other factors. Hazardous materials are defined and regulated in the U.S. primarily by laws and regulations administered by the EPA under 29 CFR 1910, OSHA under 40 CFR 355, the U.S. Department of Transportation (DOT) under 49 CFR 171-180, 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 under 10 CFR 20.

Hazardous waste is defined in the Resource Conservation and Recovery Act (RCRA) 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 CFR 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

3.7.1 Affected Environment

Hazardous Materials

Numerous types of hazardous materials are used to support the various missions and general maintenance operations at KSC. These materials range from common building paints to industrial solvents and hazardous fuels. Categories of hazardous materials used in support of past launch activities include petroleum products, oils, lubricants, VOCs, corrosives, refrigerants, adhesives, sealants, epoxies, and propellants. Storage for helium and nitrogen would also be installed at the SpaceX Operations Area. Management of hazardous materials is the responsibility of each organization.

The KSC Spill Prevention, Control, and Countermeasures (SPCC) Plan (KSC-PLN-1919) outlines the criteria established by KSC to prevent, respond to, control, and report spills of oil. Various types and quantities of oil are stored, transported, and handled to support the operations of KSC. The KSC SPCC Plan describes both the facility-wide and site-specific (KSC-PLN-1920) approaches for preventing and addressing spills.

Hazardous materials would be handled in accordance with federal, state, and local laws and regulations. SpaceX trains employees to immediately report spills to the SpaceX Environmental Health and Safety team and contain spills if safe to do so. On pervious surfaces, SpaceX manages cleanup and reporting to NASA KSC. For spills of hazardous materials to impervious surfaces, off site discharges, or other emissions, SpaceX immediately reports to KSC emergency responders. SpaceX will develop programs and maintain environmental compliance as per the EUL.

No Action Alternative

Under the No Action Alternative there would be no new operations requiring the use of hazardous materials. Therefore, there would be no impacts from hazardous materials.

Hazardous Waste

This section discusses the presence of known or suspected contaminants near the Proposed Action sites. Solid Waste Management Units (SWMUs), Potential Release Locations (PRLs), and Areas of Concern (AOCs) are generally concentrated in operational areas such as the VAB, launch complexes, and the KSC Industrial Area. The most prevalent soil contaminants are petroleum hydrocarbons, RCRA metals, and polychlorinated biphenyls (PCBs). The most prevalent groundwater contaminants are chlorinated solvents and associated degradation products.

KSC has programs to evaluate sites where contamination is present under RCRA and its Hazardous and Solid Waste Amendments. KSC's Remediation Program was initiated in response to an agreement with FDEP in the late 1980s regarding KSC's oldest contamination remediation sites or SWMUs, Wilson Corners and the Ransom Road Landfill. Since then, KSC has been working with the EPA and FDEP to identify potential release sites and implement corrective action at those sites as needed. In addition to corrective action sites, the NASA Remediation Group also manages petroleum contamination sites. To date, NASA has identified and investigated approximately 108 SWMU sites and 227 PRLs, of which 93 still require further investigation to confirm the presence or absence of contamination.

No contaminated media had been previously identified within the boundary of the Roberts Road location. At the request of SpaceX, Universal Engineering Sciences conducted limited soil and groundwater quality testing at the Roberts Road site in February 2018. Results from this investigation disclosed that constituents of concern, arsenic and PCBs, were detected in soil samples above the FDEP residential soil cleanup target levels, but below commercial and industrial soil cleanup target levels. No constituents of concern were detected in groundwater above the FDEP groundwater cleanup target levels from this investigation. NASA was apprised of this report and its findings, and is conducting confirmatory sampling of media to identify constituents of concern at this location. Results from this sampling event have not yet been received by NASA.

Two areas located in close proximity to the site that have been previously investigated are PRL #114 KSC Background Study Locations, and PRL #160 Fire Department Staging Building #1 Area. The results of the investigation for PRL #114 did not confirm exceedances detected in media at any of the locations of concern. These results indicated that no further investigation was warranted for the media evaluated at any of these locations. FDEP approved the No Further Action (NFA) recommended status in April 2002.

The Fire Department Staging Building #1 Area (PRL #160) consisted of three different locations. These locations were all private residences prior to acquisition by NASA in the early 1960s. Results from the investigation recommended confirmatory sampling. Groundwater samples were collected and the results

of this investigation indicated that releases have not occurred, and that groundwater has not been negatively impacted. Further investigation at this site was deemed unnecessary. Based upon no groundwater detections above Groundwater Cleanup Target Levels, NFA was recommended at this site and was approved by the KSC Remediation Team in August 2008.

3.7.2 Environmental Consequences

Due to the size and proximity of KSC fuel storage tanks to waterways, these locations are subjected to the SPCC regulations of 40 CFR 112. KSC currently maintains plans for spill prevention, response and reporting. An active pollution prevention program is in place to reduce the use of hazardous materials and generation of hazardous waste.

All generated wastes would be properly containerized, stored, labeled, manifested, shipped, and disposed of in full regulatory compliance. Hazardous wastes generated by SpaceX and their contractors would be manifested, shipped, and disposed of under one of the company's EPA identification numbers. SpaceX currently manages wastes under multiple EPA identification numbers based upon the address of the site. Copies of waste management records and manifests would be maintained onsite and provided for review by NASA, or regulatory agencies upon request. BMPs in place for the handling of hazardous materials and hazardous would result in minimal adverse impacts from the Proposed Action.

The Proposed Action, including construction and operation, should not have a significant impact on the NASA KSC Remediation Program plans for managing SWMU or PRL sites, since there are no confirmed remediation sites located within the project area at this time. NASA is awaiting results from the confirmatory sampling that was recently conducted at the Roberts Road location, and would coordinate any remedial actions required at this location if the presence of constituents of concern are confirmed.

<u>No Action Alternative</u>
Under the No Action Alternative, there would be no new construction and no additional processing of spacecraft by SpaceX. Therefore, there would be no additional impacts from hazardous waste management.

3.8 Water Resources

Chapter 3.4 of the PEIS (NASA 2016) and Section IV of the ERD (NASA 2015a) describe in detail the water resources (water quality, regulations, permitting, etc.) within KSC. A concise review is provided in the following sections.

3.8.1 Affected Environment

Surface Water

The inland surface waters in and surrounding KSC are shallow estuarine lagoons and include portions of the Indian River, Banana River, Mosquito Lagoon, and Banana Creek. The area of Mosquito Lagoon within the KSC boundary and the northernmost portion of the IRL, north of the Jay Railway spur crossing (north of SR 406), are designated by the State as Class II, Shellfish Propagation and Harvesting areas. All other surface waters at KSC have been designated as Class III, Recreation and Fish and Wildlife Propagation areas. All surface waters within MINWR are designated as Outstanding Florida Waters (OFW) as required by Florida Statutes for waters within national wildlife refuges. Surface water quality at KSC is generally good, with the best water quality being found adjacent to undeveloped areas of the IRL, such as Mosquito Lagoon and the northernmost portions of the Indian and Banana Rivers (NASA 2015a). Florida water bodies that are not attaining water quality criteria for designated uses require the establishment of Total

Maximum Daily Loads (TMDLs) to meet and maintain Water Quality Standards. The IRL and Banana River Lagoon have been identified by FDEP as impaired for nutrients and mercury, and Mosquito Lagoon as impaired for mercury (NASA 2015a). Both the Indian River (north of the 520 Causeway) as well as the Banana River (north and south of the 520 Causeway) are listed as impaired waters. Causes of impairment for the Indian River include low dissolved oxygen as well as fecal coliform and mercury in fish tissue above required thresholds. Similarly, causes of impairment in the Banana River include low dissolved oxygen and mercury in fish tissue above required thresholds (USAF 2015). Total Maximum Daily Loads (TMDLs) have been established for segments of the Indian River and Banana River Lagoons adjoining KSC. The site-specific nature of the OFW water quality standard and TMDL is designed to ensure against any surface water degradation.

Fresh surface waters within KSC are primarily derived from the surficial groundwater, which is recharged by rainfall. Shallow groundwater supports numerous freshwater wetlands. Both man-made drainage ditches and natural wetland areas are found within the Roberts Road site. Previous low lying areas required drainage for citrus production. Natural flow of surface water across the Roberts Road site would be west toward the Indian River. SR 3 is recognized by FDEP as the divide between the drainage to the Banana River to the east and Indian River to the west. Historically, drainage ditches within and bordering the site drained to grove discharge pump N10 (which has since been demolished) and water was pumped west to the IRL.

Floodplain

Executive Order (EO) 11988 directs agencies to consider alternatives to avoid adverse effects and incompatible development in floodplains. The Proposed Action alternative sites are located across two different Federal Emergency Management Agency (FEMA) flood zone categories, X and X500. Zone X lands are outside of the 100-year and 500-year floodplains. Zone X500 represents areas between the limits of the 100-year and 500-year flood, or certain areas subject to 100-year flood with average depths less than 0.3 m (1 ft), or where the contributing drainage area is less than 2.6 km^2 (1 mi^2). Due to lack of significant topographic relief, floodplains on KSC extend beyond the coastal dune and wetlands and into portions of all of the upland plant communities. The majority of KSC lies within the 100-year floodplain. FEMA Flood Insurance Rate Maps (FIRMs) 12009C0245G were examined at the FEMA web site, FEMA Map Service Center. The Roberts Road location is on Map 12009C0245G and is in Floodzone X with a small portion in Floodzone X500. Northeast of the site, in close proximity, is Floodzone AE, which include areas inundated by 100-year flooding with determined base flood elevations.

Groundwater Sources

The State of Florida has created four categories used to rate the quality of groundwater in a particular area. The criteria for these categories are based on the degree of protection that should be afforded to that groundwater source, with Class G-I being the most stringent and Class G-IV being the least. The groundwater at KSC is classified as Class G-II, which means that it is a potential potable water source and generally has a total dissolved solids content of less than 10,000 mg/l (parts per million [ppm]). The subsurface of KSC is comprised of the Surficial Aquifer, the Intermediate Aquifer, and the Floridian Aquifer. Recharge to the Surficial Aquifer system is primarily due to precipitation. Of the approximately 140 cm (55 in) of precipitation occurring annually, approximately 75% returns to the atmosphere through evapotranspiration. The remainder is accounted for by runoff, base flow, and recharge of the Surficial Aquifer. However, the quality of water in the KSC aquifer is influenced by the intrusion of saline and

brackish surface waters from the Atlantic Ocean and the IRL. This is evident from the high mineral content, principally chlorides, that has been measured in groundwater samples from various KSC surveys.

Groundwater Quality

The quality of water in an aquifer is dependent upon the characteristics of the underlying rocks, the proximity of the aquifer to highly mineralized waters, the presence of residual saline waters, and the presence of chemical constituents in the aquifer and overlying soils.

The Surficial Aquifer is classified by FDEP as a Class G-II, defined as able to supply water treatable for human consumption. The surficial aquifer does not, nor is planned to, be used to supply potable water to KSC.

Unconsolidated, surficial aquifers are subject to contamination from point sources and from general land use. Contaminants may include trace elements, pesticides, herbicides, and other organics. Urban and agricultural land uses have affected some Florida Aquifers (Rutledge 1987, Barbash and Resek 1996). Point source contamination to the KSC Surficial Aquifer has occurred at certain facilities (NASA 2015a).

Baseline conditions of the KSC Surficial Aquifer have been studied in some detail (Schmalzer et al. 2000, Schmalzer and Hensley 2001). In the 2001 study, six sample sites were located in each subsystem of the Surficial Aquifer for a total of 24 sites. Shallow and deep groundwater samples were analyzed for organochlorine pesticides, aroclors, chlorinated herbicides, polycyclic aromatic hydrocarbons, total metals, DO, turbidity, pH, specific conductivity, temperature, total dissolved solids, and total organic carbon. These data suggested that widespread contamination of the Surficial Aquifer on KSC has not occurred (Schmalzer and Hensley 2001).

The groundwater quality in the Intermediate Aquifer system varies from moderately brackish to brackish due to its recharge by upward leakage from the highly mineralized and artesian Floridan Aquifer system, and in some cases from lateral intrusion from the Atlantic Ocean. Groundwater in the semi-artesian Sand and Shell Aquifer is brackish. Groundwater in the Shallow Rock Aquifer is brackish with some sites receiving seawater intrusion. The limited data for the thin Hawthorn Limestone Aquifer indicate that it is moderately brackish (Clark 1987).

The Floridan Aquifer system underlying KSC contains exceedingly mineralized water with high concentrations of chlorides as a result of seawater that was trapped in the aquifer when it formed. The high concentrations of chlorides can also be explained to a lesser degree by induced lateral intrusion (due to inland pumping) and a lack of flushing due to a low proximity to freshwater recharge areas (Clark 1987).

Site-specific groundwater flow direction is expected to mimic site topography. At the Roberts Road site, groundwater flow is generally west in the direction of the Indian River. Local features such as the location of drainage ditches and large surface water bodies would influence groundwater flow direction.

3.8.2 Environmental Consequences

This section describes potential impacts on surface water and groundwater resources as a result of the Proposed Action and No Action alternative. Determination of water resource impacts is based on an analysis of the potential for activities to affect surface water or groundwater quality as defined by applicable laws and regulations. Considered in this analysis is activity-related introduction of contaminants into surface water or groundwater resources, and physical alterations or disturbances of overland surface water flows and groundwater recharge.

Many construction activities can impact surface water quality by increasing run-off from vegetation clearing, soil disturbance, and grading. Exposed soils are more easily transported and can increase turbidity and nutrient loads of surface waters or wetland systems. Compacted soils are less permeable and can increase runoff. These impacts could potentially be significant, but would be lessened to moderate through the use of Best Management Practices (BMPs).

Infrastructure such as facilities, paved areas, and landscaped areas would alter, to some degree, the hydrological cycle and surface/groundwater quality. Specific site plans for the proposed sites have not yet been finalized, so exact quantities of new impervious surfaces cannot be determined. Impervious surfaces such as roads, sidewalks, parking lots, and buildings reduce the area available for rainwater to percolate into the soil. This has two direct consequences: there is less water available for recharging the local surficial aquifer, while at the same time, the amount of runoff that flows into low-lying areas increases. Stormwater management systems would help mitigate many of the impacts associated with impervious surfaces. However, extreme rainfall events associated with tropical systems would likely exceed the capacity of most stormwater systems, and some runoff could be transported off-site.

Surface Water

Land disturbing activities during construction at all Proposed Action sites would have the potential to result in moderate adverse impacts to surface water quality. These impacts would be lessened with the implementation of BMPs.

There are drainage ditches and wetlands at the site, some of which would require filling. This would involve permitting through the St. Johns River Water Management District (SJRWMD) and U.S. Army Corps of Engineers and would constitute a moderate impact. Measures would be taken to minimize harm to wetlands, including implementing BMPs and adherence to permit conditions. Stormwater management systems would be built to treat runoff from impervious surfaces of new facilities. An Environmental Resource Permit (ERP) would be obtained from the SJRWMD.

<u>No Action Alternative</u>

Under the No Action Alternative, there would be no new construction and no change in impervious surface.

Floodplain

A very small area of the Roberts Road site is within floodplain zone X500 which represents areas between the limits of the 100-year and 500-year flood.

NASA would ensure that its actions comply with EO 11988, Floodplain Management, to the maximum extent possible. Since the Proposed Action would involve federally funded construction in the floodplain, this EA serves as NASA's means for facilitating public review as required by EO 11990 and EO 11988.

<u>No Action Alternative</u>

Under the No Action Alternative, there would be no new construction. Therefore, there would no additional impact to floodplains on KSC.

Groundwater

Groundwater quality is affected by runoff that percolates into the surficial aquifer from roadways and facilities. Construction at the Roberts Road site for the Proposed Action would temporarily increase the amount of sedimentation and, therefore, pollutants that could migrate into the groundwater system.

Employing BMPs such as silt fences and turbidity barriers and constructing stormwater management systems would reduce groundwater quality impacts to a minimal amount.

For Roberts Road site development, a National Pollutant Discharge Elimination System (NPDES) Stormwater Construction Permit would be required by FDEP, and a Stormwater Pollution Prevention Plan (SWPPP) would have to be implemented. A stormwater management system would need to be designed and an ERP obtained from SJRWMD for any activity that meets the requirements listed in Rule 40C, F.A.C. The Proposed Action would have minimal impact to the groundwater quality. Impacts from surface water degradation would be absorbed by the surface water management system that would be constructed, preventing transfer of pollutants into the groundwater.

Impacts to groundwater would be minimal to none with required treatment of runoff by a permitted stormwater management system prior to percolation into the ground. The potential local impacts to hydrology and water quality from the construction and operation of vehicle processing, and fuel storage sites are summarized in Table 3-6.

No Action Alternative

No construction or ground disturbing activities would occur under the No Action Alternative. Therefore there would be no impacts causing groundwater degradation.

Table 3-6. General Site-Specific Impacts to Hydrology and Water Quality Associated with Construction and Operations of Roads and Facilities

Activity	Impact
Vegetation Clearing	Alters local evapotranspiration processes, exposes soil to wind and rain erosion (turbidity), reduces storage, increases runoff potential, alters surficial aquifer recharge rates.
Soil Disturbance	Alters runoff, storage, and infiltration rates. Increases turbidity potential.
Grading	Alters runoff, storage, and infiltration rates. Increases turbidity potential.
Impervious Surfaces	Alters runoff, storage, and infiltration rates. Alters local evapotranspiration processes. Reduces local surficial aquifer recharge.
Landscaping	Alters local evapotranspiration processes, runoff, storage, and infiltration rates. Use of fertilizers and pesticides. Mowing and other maintenance often required.
Irrigation	Alters local evapotranspiration processes, runoff, storage, and infiltration rates. Impacts to surficial aquifer.
Stormwater Conveyance	Alters local evapotranspiration processes, runoff, storage, and infiltration rates. Impacts to surficial aquifer.
Retention Ponds	Alters local evapotranspiration processes runoff, storage, and infiltration rates. Impacts to surficial aquifer.

Activity	Impact
Vehicle Use	Increased loading of pollutants associated with parking lots, roads, tires, fossil fuel combustion (NO_2, CO, CO_2, grease and oil, polycyclic hydrocarbons, metals).
Ground Processing	Accidental releases of a variety of chemicals could occur during the operational phase of the Proposed Action and potentially affect surface and groundwater quality.

3.9 Geology and Soils

Florida has a complex geologic history with repeated periods of deposition when the Florida Plateau was submerged under the ocean alternating with erosion when the ocean receded. The oldest formations known to occur beneath the KSC area were deposited in the early Eocene Epoch (56 to 43 million years ago) in an open ocean. The ensuing cycle of erosion and deposition through the ages resulted in a current surface strata of primarily unconsolidated white to brown quartz sand containing beds of sandy coquina of Pleistocene and Holocene age (NASA 2015a). A detailed description of the geologic process is given in the PEIS (NASA 2016).

Merritt Island formed as a prograding barrier island complex (i.e., one that builds seaward). The eastern edge of Merritt Island along the Mosquito Lagoon and the Banana River is a relict cape aligned with False Cape. Multiple dune ridges interspersed with low-lying areas represent successive stages in this growth. The western portion of Merritt Island is substantially older than the east, and erosion has reduced the western side to a nearly level plain. Cape Canaveral is also part of the prograding barrier island complex, the result of southward growth of an original cape at the site of the present False Cape. Multiple dune ridges on Cape Canaveral are evidence that alternating periods of deposition and erosion occurred there as well.

Soil is a collective term for the inorganic and organic substrate covering bedrock in which vegetation grows and a multitude of organisms reside. Soil resources provide a foundation for both plant and animal communities, and these resources are equally important in both terrestrial and aquatic environments (NASA 2015a).

Detailed discussions of geology and soils at KSC are available in the KSC PEIS and ERD (NASA 2016, and NASA 2015a). A summary is provided in the following paragraphs.

3.9.1 Affected Environment

The soils at KSC were mapped by the Soil Conservation Service (SCS); now the Natural Resources Conservation Service) and its Florida partners in the soil surveys for Brevard County (SCS 1974) and Volusia County (SCS 1980). Fifty-eight soil series and land types occur at KSC, even though Merritt Island is a relatively young landscape (NASA 2015a).

Soils at the Roberts Road site are comprised of five types: Anclote Sand (0.6 ha [1.6 ac]), Bradenton Sand (13.3 ha [32.9 ac]), Copeland Complex (11.9 ha [29.4 ac]), Myakka Sand (0.5 ha [1.2 ac]), and Wabasso Sand (0.7 ha [1.8 ac]). All of these soils are poorly drained and nearly level. Permeability is rapid in the sandy types and moderate in the Copeland Complex (SCS 1974).

3.9.2 Environmental Consequences

Land clearing and site preparation activities at the Roberts Road site would cause disturbance to the upper soil layers of this heavily vegetated location, but the poorly drained soil types present are common on KSC and in east-central Florida. Overall impacts would be considered none to geology and minimal to soils.

No Action Alternative

Under the No Action Alternative, there would be no new construction or land disturbance. Therefore, no additional impacts to geology and soils on KSC would occur.

3.10 Transportation

KSC is serviced by over 340 km (211 mi) of roadways. NASA Causeway is the primary entrance and exit for cargo, tourists, and personnel to KSC. The four-lane road originates on the mainland in Titusville as SR 405 and crosses the Indian River onto KSC. After passing through the Industrial Area, the NASA Causeway reduces to two lanes of traffic, crosses the Banana River, and enters CCAFS, serving as the Air Force installation's west access road. The major north-south artery for KSC is Kennedy Parkway (SR 3). It can be accessed from the north where it intersects with US 1 south of Oak Hill and from Titusville via SR 406/402. The southernmost entrance and exit for KSC is SR 3 on north Merritt Island.

Currently, only one gate operates at CCAFS, the south (main) gate on SR 401, and serves as the primary entrance and exit for cargo and personnel. SR 401 eventually leads into Phillips Parkway, which is the main north-south artery for the installation. CCAFS may also be accessed from the west via NASA Causeway leading over from KSC (USAF 2017).

A majority of the roads at KSC are the product of the intense federal investment in infrastructure that was made at the dawn of the space program in the 1960s. At that time, Merritt Island was sparsely populated and the space program required significant federal dollars to achieve its ends (https://masterplan.ksc.nasa.gov/Future-State/Future-Transportation/Road). Cape Canaveral also remained largely uninhabited until the mid-nineteenth century. The federal government's interest in Cape Canaveral increased in the late 1940s when the federal government began to purchase land from the state to establish a long-range proving ground (USAF 2015).

3.10.1 Affected Environment

From the proposed site, transport of space vehicles to LC-39A would involve taking SR3 to Saturn Causeway, which leads directly to the LC-39A. Transportation to LC-40 would require traveling on SR 3 to NASA Causeway east to CCAFS. Once on the Air Force installation, Phillips Parkway to Heavy Launcher Road to ICBM Road would lead to LC-40.

The Roberts Road site is currently undeveloped and would require upgrades to Roberts Road south of the site and A Avenue along the east side. SpaceX intends to pave Roberts Road and A Avenue along the length of the proposed site and add left turn lane capability to SR 3.

Figure 3-1. SpaceX Transportation Routes on KSC and CCAFS

3.10.2 Environmental Consequences

The Proposed Action would result in the continuation of many of the modes of transportation presently occurring at KSC, but potentially in greater amounts. SpaceX estimates a possible 150 construction jobs associated with the initial development of the Proposed Action, and approximately 70 new SpaceX employees to support additional operations on KSC. SpaceX plans to launch more than 4,000 satellites with the intention that most of these satellites will be launched from LC-39A and LC-40. Short- and long-term moderate adverse effects would be expected. The Proposed Action is not expected to cause appreciable changes in the overall traffic volume at KSC, however, some components could affect the level of service at intersections or roadways both on and off the Center (NASA 2016). Short-term increases in traffic would result from construction worker commutes during construction and modification activities of new or existing facilities. Long-term adverse effects would be primarily due to additional worker commutes, transport of spacecraft components, and changes in traffic patterns near more centralized activities at KSC. Increased traffic volumes and changes in traffic patterns would have moderate effects, as would planned improvements to Roberts Road, A Avenue, and new turn lane on SR 3. There would be some long-term beneficial effects from upgrades in transportation infrastructure along Roberts Road leading to the site. The Roberts Road site is currently undeveloped and would require upgrades to Roberts Road, currently a one lane unpaved road, and connections to infrastructure paralleling SR 3. The PEIS (NASA 2016) assessed the effect of proposed KSC operations and construction on traffic and transportation for a planning horizon of 2012-2032. No additional evaluation under tiered NEPA would be required unless the project met certain criteria including addition or closure of roadways or access control points, or construction of greater than 92,900 m^2 (1,000,000 ft^2). The proposed SpaceX action does not meet these criteria and therefore no traffic study is necessary.

<u>No Action Alternative</u>

The No Action Alternative would result in no changes in the impact to traffic and transportation. KSC operations and the current levels of activities would continue without changes, and traffic and transportation would remain unchanged when compared to existing conditions (NASA 2016). Road improvements would not be necessary.

3.11 Utilities

The SpaceX Roberts Road Operations Area would require access to electric, fiber connectivity, water, sewer, and high-pressure gases. Development of the new facilities would include activities such as construction of roads, upgrading and installing aboveground and underground utilities, excavation, foundation pouring, and the building of structures. Existing utilities in the vicinity of Roberts Road are shown in Figure 3-2.

KSC is a retail electricity, natural gas, and fuel oil customer. The Utilities Systems land use classification at KSC includes land and facilities associated with KSC utilities infrastructure and systems (i.e., water, wastewater, gas, electrical, chilled water, medium temperature hot water, communications and sewer systems). Utility systems currently occupy over 404 ha (1,000 ac) of land at KSC. Utility easements help to define patterns and impacts associated with the development of utility systems and the overall land use pattern (NASA 2015a).

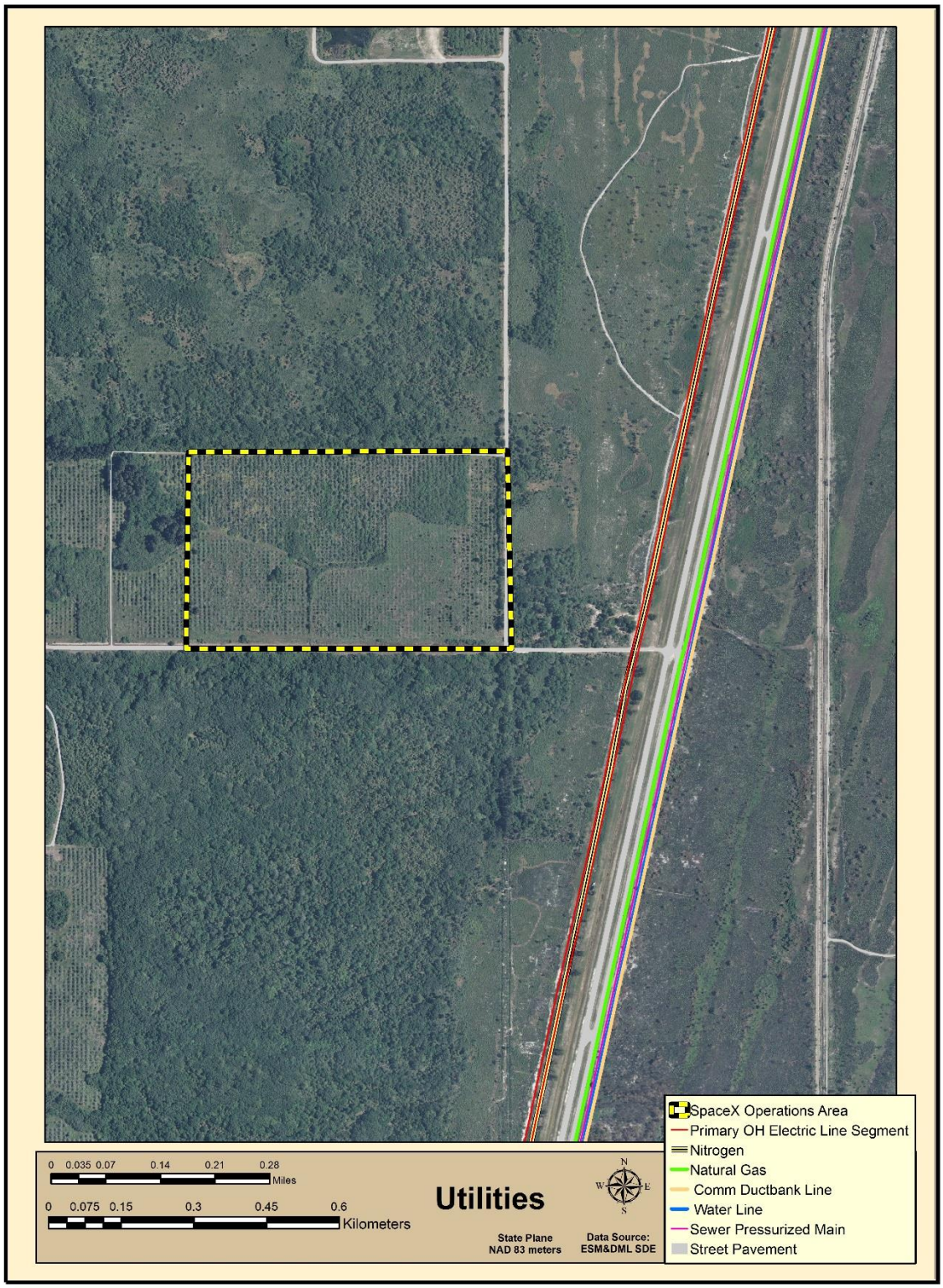

Figure 3-2. Existing Utilities in Vicinity of the SpaceX Roberts Road Site

3.11.1 Affected Environment

Drinking Water

The Safe Drinking Water Act was established to protect the quality of drinking water and its surface water and groundwater sources. Florida is divided into five regional water management districts. Brevard County is located in the SJRWMD. The water management districts are responsible for regulating the supply of drinking water and conserving the state's water resources (FDEP 2014). KSC is subject to regulation under the Safe Drinking Water Act as suppliers since each separately operates a Non-Transient, Non-Community "Public Water System" as defined by state and federal regulations.

The source of KSC's drinking water supply is surface water from the Taylor Creek Reservoir and groundwater from wells located in east Orange County. The City of Cocoa operates the Claude H. Dyal Water Treatment Plant that treats the raw water from these sources. Water from this plant is transmitted to KSC via a 61 cm (24 in) primary distribution system from the South Gate to the VAB area. Throughout KSC there are various storage systems and secondary pump systems to supply water needs for fire suppression, launch activities, and potable water (NASA 2015a).

Domestic and Industrial Wastewater

State regulatory authority over wastewater treatment facilities was established by the Florida Air and Water Pollution Control Act Chapter 403 F.S. of 1967. Under these laws, the State of Florida has delegated the FDEP to promulgate regulations and administer programs for the enforcement of state and federal laws concerning the disposal of domestic wastewater. FDEP has developed the Domestic Wastewater Program to set treatment standards and operating practices to protect the health and safety of the public, to protect aquifers, lakes and rivers from harm, and to promote reuse of reclaimed water. FDEP and State Health Departments are responsible for enforcing these regulations and permitting treatment systems (NASA 2015a).

In an effort to restore and maintain the chemical, physical, and biological integrity of the nation's waters, the federal government enacted the Federal Water Pollution Control Act, commonly known as the Clean Water Act amended in 1977. Most industrial wastewater discharges are regulated by specific federal requirements at a minimum. However, if additional treatment is necessary to protect Florida's water quality standards, the industries must provide it (NASA 2015a).

To manage domestic wastewater, KSC and CCAFS have a collection and transmission system that transports wastewater to the Cape Canaveral Regional Waste Water Treatment Facility (WWTF) located on CCAFS and operated by the Air Force under Permit FL0102920. Domestic wastewater processed by the WWTF meets all federal and state requirements for testing and quality. The system dates to the 1950s when Cape Canaveral was first built. The wastewater system consists of water treatment facilities, pre-treatment facilities, and lift stations. These facilities are connected by a collection system of almost 161 km (100 mi) of sewer mains, about 80 km (50 mi) of which are located on KSC property (KSC 2017).

The only groundwater point source discharge at CCAFS is the treated domestic wastewater effluent. The treatment plant effluent and groundwater monitoring is stipulated by the NPDES permit to ensure no significant degradation of groundwater, and to ensure effluent is not discharged to surface waters. The CCAFS WWTF includes advanced treatment processes that produce effluent suitable for re-use. Impacts to CCAFS groundwater resources, primarily groundwater mounding, are limited to a small area in the immediate vicinity of effluent disposal facilities. No significant impacts have been documented or

anticipated on the natural communities near the WWTF and the percolation ponds from the disposal of wastewater effluent (USAF 2015).

Stormwater

Impervious areas constructed after 1992 are subject to the FAC and requirements of the SJRWMD to provide for the treatment of pollutants and the attenuation of potential flooding impacts. As facilities are improved or built, stormwater systems must be built or upgraded to be consistent with the requirements of SJRWMD Rule 40C-4, FAC. SpaceX would be required to submit plans for stormwater treatment systems to the SJRWMD as part of the ERP application process and receive permits prior to beginning construction.

Man-made ditches exist within the Roberts Road site and were used to drain low lying areas required for citrus production. These ditches and those bordering the site historically drained to grove discharge pump N10 and were pumped west to the IRL. Pump N10 is no longer operational. There are currently no stormwater permits for this site.

Natural Resources and Energy

The electrical power for KSC is purchased from FPL at 115 kV and stepped down to 13.8 kV at two locations to serve KSC. The Center owns and maintains the 13.8 kV medium voltage distribution system, which would serve the facilities at the SpaceX site on Roberts Road.

In a unique public-private partnership between FPL and NASA that demonstrates a commitment to bringing clean-energy solutions to the state of Florida, solar photovoltaic power facilities have been constructed at KSC. This partnership is helping to provide clean, renewable power to Florida residents and to support America's space program by supplying electricity directly to KSC and reducing reliance on fossil fuels thereby working toward improving the environment (KSC 2017).

An FPL solar array located in the southern portion of KSC produces an estimated 10 megawatts of clean, emissions-free power for FPL customers, which is equivalent to serving approximately 1,100 homes. A separate solar facility of approximately one megawatt located in the Industrial Area provides clean power directly to KSC and is helping NASA meet its renewable energy goals. Additional solar photovoltaic power facilities are planned for the future (KSC 2017).

From an efficiency or sustainability standpoint, FPL breaks down their energy production by fuel type for 2016 as follows:

1. 70% Natural Gas
2. 23% Nuclear
3. 3% Purchased Power
4. 4% Coal

Source: http://www.nexteraenergy.com/pdf/annual.pdf 2016.

A natural gas distribution infrastructure was built in 1994 to support the activities at KSC. The system was expanded in 1999 to CCAFS. Natural gas is used as the main fuel source for heating plants at the VAB and at the KSC Industrial Area, providing hot water for building heating and domestic hot water purposes. The main pipeline runs through KSC property but is owned by Florida City Gas, the local natural gas utility. The main 30 cm (12 in) natural gas pipeline enters KSC where NASA and Kennedy Parkways intersect. A 20 cm (8 in) branch line continues to serve CCAFS. Florida City Gas is responsible for the gas main from

its station off of NASA Causeway up to and including meters to various facilities in the VAB and industrial areas of KSC. Contractors on KSC are responsible for operation and maintenance of natural gas systems downstream of the meter stations (KSC 2017).

3.11.2 Environmental Consequences

Impacts to electricity, natural gas, communications, and solid waste infrastructure at KSC would be moderate. These utilities and services are currently available at or within reasonable proximity to the Proposed Action. Some utilities ducts and infrastructure would need to be laid and tie-ins established during construction. A new electric substation may be required and would be developed in coordination with FPL. A wastewater lift station would be installed to support flow rate to the entire site. Enhancements to the existing KSC force main may be necessary. Industrial wastewater not listed as an approved discharge in the KSC Industrial Wastewater Inventory or approved for discharge to the CCAFS wastewater treatment facility would have the potential for moderate impacts. However, these impacts would be mitigated by obtaining an FDEP industrial Wastewater Permit as required and adhering to permit conditions. Water supply impacts during construction would be minimal since potable water resources are available near the proposed site. The KSC water distribution system is sized to accommodate short-term, high-volume flows required for launches (NASA 2016). Therefore, impacts to water supply and treatment to support activities at the SpaceX Operations Area would be minimal.

<u>No Action Alternative</u>
Under the No Action Alternative, there would be no new facilities construction requiring modification or installation of utilities. Therefore, no additional impacts to KSC utilities would occur.

3.12 Health and Safety

It is NASA policy to provide a safe and healthy work environment for its workforce. KSC complies with applicable regulations of other federal agencies exercising regulatory authority over NASA in specific areas (e.g., the Department of Labor's OSHA, and the DOT), as well as internal NASA safety policies and requirements. In the event of conflicting standards or regulations, the more stringent requirements are applicable.

3.12.1 Affected Environment

The areas in and around KSC that could be affected by payload processing and transport are the subject of health and safety concerns. Range safety regulations for KSC are contained in NPR 8715.5A, which incorporates information that Range Safety organizations review, approve, and monitor; safety holds on all prelaunch and launch operations are imposed when necessary. The objective of the Range Safety Program is to ensure that the general public, personnel, environment, and area resources are provided an acceptable level of safety, and that all aspects of prelaunch and launch operations adhere to public laws. Hazardous materials such as residual propellants, ordnance, chemicals, and booster/payload components are transported in accordance with U.S. DOT regulations for interstate shipment of hazardous substances (Title 49 CFR 100-199). All personnel involved in the handling of hazardous materials and hazardous waste receive safety and environmental awareness training concerning the property handling techniques and spill response activities for these hazardous materials (NASA 2018).

KSC, CCAFS, the City of Cape Canaveral, and Brevard County have a mutual-aid agreement in the event of an emergency. During launch activities, CCAFS maintains communication with KSC, Brevard County

Emergency Management, the Florida Marine Patrol, the U.S. Coast Guard, and the State coordinating agency, the Division of Emergency Management. Range Safety monitors launch surveillance areas to ensure that the risk to people, aircraft, and surface vessels is within acceptable limits. Control areas and airspace are closed to the public as required (USAF 1998).

Emergency medical services for KSC personnel are provided by the KSC Occupational Health Facility staff. Additional health care services are available at nearby public hospitals in Titusville, Rockledge, and Cocoa Beach. Fire and police protection on KSC are provided by private contractors.

3.12.2 Environmental Consequences

Potential adverse effects to human health and safety could occur during construction and facility modifications, and industrial operations attributed to the Proposed Action. Compliance with OSHA regulations and other recognized standards would be implemented during the construction and operational phases. Construction contractors would comply with OSHA regulations, other recognized standards, and applicable NASA regulations or instructions prescribed for the control and safety of personnel and visitors to the job site.

Daily industrial operations would result in the continuation of many of the types of noise presently occurring at KSC. The loudest noise generated by industrial activities at KSC is produced by hydraulic pumps operating within the confines of their enclosures. Operators are required by OSHA and NASA regulations to be equipped with hearing protection devices. Therefore, human health and safety would not be adversely impacted by general construction-related hazards or daily industrial operations. With the implementation of safety and health plans, and environmental protection measures, potential health risks to project personnel and the public from construction and operations would be minimal.

Physical hazards typical for outdoor environments are present in the proposed project areas and have the potential to adversely impact the health and safety of personnel during construction. To provide for the health and safety of workers and visitors who may be exposed to hazards during construction, federal OSHA regulations would be implemented, and health and safety plans would be developed and implemented. To minimize the potential adverse impacts from hazards during construction and operations, awareness training would be incorporated into the worker health and safety protocol. Therefore, human health and safety would not be adversely impacted by construction/modification and operational hazards. With the implementation of safety and health plans, and environmental protection measures, potential health risks to project personnel and the public from construction/modifications and operations would be minimal.

Commercial entities that use KSC would be required to comply with all applicable safety regulations for storage, use, and transfer of toxic and hazardous materials associated with their projects. In the Proposed Action, the frequency with which hazardous materials are used, handled, transported, etc., would be increased. As a result of the increase in exposure and the activities related to these materials, the risks associated with them are also slightly increased. The importance of adhering to proper safety procedures must be viewed as a top priority for future operations to minimize the risks of accidental release and personnel exposure. Due to the regulatory and safety requirements inherent in the industry and the nature of expected operations, it is considered likely that sufficient engineering and administrative controls would mitigate the risks associated with the presence of these materials to the lowest possible level.

QDs show radii for intralines, inhabited buildings, and other pertinent assets. These QDs are based on the greatest allowable amount of explosives, solid rocket motors, liquid propellants, or other hazardous

materials that may be stored at a facility. The radius distances are calculated from the formulas and tables in the Air Force Regulation 127-100. This regulation implements the Department of Defense Ammunition and Explosives Safety Standards outlined in DOD Directive 5154.4-S. These standards also agree with OSHA Standards 1910.109 (NASA 2015a).

The severity of an unplanned event is unlikely to increase. The probability of an accidental release would increase due to the increased activities and quantity of materials, but best practices would ensure this increased risk is minimal. Due to the potential storage of significant quantities of hazardous commodities, SpaceX is required by NASA to submit documentation of worst case storage and processing scenario possibilities and how spills/releases would be managed and contained. If reasonable and prudent measures are taken, operations associated with the Proposed Action would result in minimal impacts to health and safety, with the probability of a major spill kept at a minimum (NASA 2016).

No Action Alternative

Under the No Action Alternative, there would be no construction of new facilities and no additional processing of spacecraft by SpaceX on KSC. Therefore, there would be no additional impacts to health and safety would occur.

3.13 Socioeconomics

A detailed overview of the current socioeconomic conditions for both the KSC vicinity and the state of Florida is provided in the KSC PEIS (NASA 2016). It identifies socioeconomic issues that would be sensitive to changes affected by the KSC Master Plan for a multi-user spaceport over a 20-year period (2012-2032).

3.13.1 Affected Environment

The KSC PEIS (NASA 2016) presents data for Brevard and Volusia counties and compares them to demographic and economic data for the State of Florida. Potential impacts with the greatest likelihood, magnitude, duration, and extent would occur in Brevard and Volusia counties. The proposed SpaceX site represents one of many notional components considered in the PEIS. SpaceX estimates a possible 150 construction jobs affiliated with the development of the Proposed Action and approximately 70 new SpaceX employees for the additional operations on KSC.

3.13.2 Environmental Consequences

Overall, the direct, economic impacts resulting from the SpaceX site would be positive. The Proposed Action would create beneficial moderate impacts due to the creation of jobs and labor income over the next two decades. Indirect and long-term impacts from this project on the local economy depends on factors such as awareness and financial commitment, specifically to the SpaceX program. If commitment is sustained over the long-term, indirect economic impacts would be significant. Future employees for SpaceX and its subcontractors would represent new purchasing power that would concomitantly support additional jobs and payroll at local retail and service establishments in the area. The KSC PEIS (NASA 2016) described the larger multiplier effect associated with consumer spending of employees directly supported by new programs such as the Proposed Action. Through this spending, the SpaceX proposed action could support hundreds of indirect and induced jobs.

No Action Alternative

Should the proposed project not be implemented, no socioeconomic changes would occur in Brevard or Volusia counties. There would be no change to employment, population, income, housing, economic activity, or quality of life. Fluctuations would occur at rates consistent with historical patterns.

3.14 Environmental Justice

As described in detail in the KSC PEIS (NASA 2016), the population inhabiting the Region of Influence (ROI) for the Proposed Action (Brevard County and Volusia County) is not comprised of greater than 50% minorities and does not exceed the percentage of minorities as compared to the rest of Florida. In addition, the poverty level coupled with median household income levels are lower or comparable to the rest of Florida, and the majority of the population is living well above the poverty level as defined by the U.S. Department of Health and Human Services. Therefore, disproportionate impacts to either minorities or low-income residents in the ROI would not occur.

No Action Alternative

Under the No Action Alternative the SpaceX site on KSC would not be built. There would be no additional spacecraft processing by SpaceX on KSC. Therefore, no impact on Environmental Justice would occur as a result of the implementation of the No Action Alternative.

4.0 CUMULATIVE IMPACTS

Federal regulations implementing NEPA require that federal agencies include an analysis of potential cumulative effects of a proposed action. CEQ regulations implementing the procedural provisions of NEPA define cumulative effects as follows (40 CFR Part 1508.7): The impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what entity (federal or non-federal) or person undertakes such other actions. This includes those that may be "individually minimal but collectively significant actions taking place over time."

4.1 Projects Considered for Potential Cumulative Effects

Future development and activities that may occur at or near the Proposed Action were researched and considered. Projects planned at CCAFS, Port Canaveral, and KSC including Exploration Park and the Visitor Complex are discussed in the following paragraphs. Many of these actions involve federal agency agreements or funding and have already had required NEPA documents prepared or would be required to go through NEPA coordination and documentation.

The future land use plan for KSC promotes the most efficient use of land area resources balanced with an understanding of development suitability and capacity. KSC's transition to a multi-user spaceport advocates compatible relationships between adjacent land uses, encourages infill development, and preserves environmentally sensitive areas (NASA 2016). Current actions at KSC include Ground Systems Development and Operations (GSDO) leading the Center's transformation from a historically government-only launch complex to a spaceport with activity involving government and commercial vehicles alike. The program's primary objective is to prepare the Center to process and launch the next-generation vehicles and spacecraft designed to achieve NASA's goals for space exploration.

Under a 20-year Commercial Space Launch Act agreement between NASA and SpaceX, LC-39A is being used for processing and launch of Falcon 9 vehicles. It is also being modified to support launch of the Falcon Heavy vehicle in the near future. In 2015 SpaceX constructed a 4,645 m^2 (50,000 ft^2) Falcon Integration Hangar at the entrance to LC-39A. Primary components of the hangar include dual overhead bridge cranes, embedded integration rail, and an over-sized door for access of flight hardware and ground support equipment.

LC-39B is under the process of redevelopment for the Space Launch System (SLS) rocket and Orion spacecraft. The pad was returned to a clean design after removal of the Fixed Service Structure. This will allow 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. NASA has announced LC-39B would be available to commercial users during times when it is not needed by SLS.

KSC's newest launch pad, designated 39C, is designed to accommodate Small Class Vehicles. Located in the southeast area of the LC-39B perimeter, this new concrete pad measures about 15 m (50 ft) wide by about 30 m (100 ft) long. Launch Pad 39C will serve as a multi-purpose site allowing companies to test vehicles and capabilities in the smaller class of rockets, making it more affordable for smaller companies to break into the commercial spaceflight market. As part of this capability, NASA's Ground Systems Development and Operations Program developed a universal propellant servicing system, which can

provide liquid oxygen and liquid methane fueling capabilities for a variety of small class rockets. This system is slated for operational readiness in the summer of 2016.

With the addition of Launch Pad 39C, KSC can offer the following processing and launching features for companies working with small class vehicles (maximum thrust up to 200,000 lbs):

- Processing facilities – i.e. Vehicle Assembly Building
- Vehicle/payload transportation (KAMAG, flatbed trucks, tugs, etc.) from integration facility to pad
- Launch site
- Universal propellant servicing system (liquid oxygen [LOX], liquid methane)
- Launch control center/mobile command center options

The GSDO plans to construct LC-48 as a multi-use launch complex for Small Class Launch vehicles. This launch complex would be located approximately 1,981 m (6,500 ft) southeast of LC-39A and 1,591 m (5,220 ft) north of LC-41. Development could also include construction of a Horizontal Integration Facility, Manufacturing and Refurbishment Facility, and Vertical Landing Facility near the launch complex, on other undeveloped areas at KSC, in an area sited for industrial use, on CCAFS, or elsewhere off Center property.

Blue Origin is building a manufacturing facility that is partially operational and projected to be fully operational by the end of 2018. That project location is Exploration Park Phase 2 and consists of 56 ha (139 ac) located on the west side of Space Commerce Way and would include site preparation, construction, and operation of a manufacturing and processing facility that would support development of reusable launch vehicles utilizing rocket-powered Vertical Take-off and Vertical Landing systems (GSDO 2017). There are also plans for additional development by Blue Origin on a parcel of land south of the current development site for expansion of their manufacturing, assembly, and test facilities.

OneWeb has begun construction of a 9,290 m^2 (100,000 ft^2) satellite spacecraft integration facility at Exploration Park (GSDO 2017, Space Florida 2017). The facility is expected to open in 2018. A U.S. subsidiary of a Swiss aerospace company, RUAG Space USA Inc., is opening a spacecraft parts manufacturing plant in Titusville. Initially they will manufacture satellite structure for OneWeb. RUAG will be a tenant of the Port Canaveral Logistics Center in south Titusville.

Increased flight operations at the SLF would involve construction of new facilities and increased flight operations at the SLF in the following broad categories: commercial spaceflight program and mission support aviation, aviation test operations including unmanned aerial vehicles, airborne research and technology development and demonstration, parabolic flight missions, testing and evaluation of experimental spacecraft, ground based research and training, and development and demonstration of future supersonic passenger flight vehicles. To take full advantage of the capabilities of the SLF, new construction would occur at both the south- field and mid-field sites.

A fuel farm is proposed for construction on the north corner of the existing apron at the SLF that was used as the foundation for the Shuttle mate/de-mate device. The fuel farm will consist of a new 75,708 l (20,000 gal) Jet-A fuel storage tank, a 3,785 l (1,000 gal) compartmentalized fuel tank for both diesel and unleaded gasoline, space for a future 75,708 l (20,000 gal) Jet-A fuel storage tank, a spill containment area, fuel level monitoring systems for all three fuel types, bollards to protect the fuel tanks, and the associated electrical work to tie the new system into the existing electrical system at the SLF.

Virgin Galactic's space tourism spinoff company, Virgin Orbit, has developed LauncherOne to serve the small-satellite industry. LauncherOne is a two-stage, expendable, LOX/RP-1 rocket that launches from a

dedicated 747-400 carrier aircraft. It may operate from multiple locations including KSC. LauncherOne will be capable of placing a 300 kg (661 lbs) payload into a sun-synchronous orbit and a 450 kg (992 lbs) payload into an equatorial orbit (Virgin Orbit 2017).

Space Florida has announced that cargo airline FedEx Express will set up operations at the SLF. FedEx Express, a subsidiary of courier company FedEx Corporation will be the first commercial aircraft of its kind to be located at the SLF (FedEx 2017).

The Kennedy Space Center Visitor Complex proposes to construct a new access road providing an entry from Space Commerce Way. The four-lane road would connect Space Commerce Way to the southwest corner of the existing Visitor Complex parking lot. Construction would include the necessary stormwater treatment facilities and a multi-use utility corridor.

The Visitor Complex plans to focus on Mars missions with a major expansion in the next five years. In the works are a "Mars Rover,' as well as an attraction allowing visitors to experience weightlessness or increased G-forces similar to what astronauts experience. The Mars Deep Space attraction could open as early as 2021 (Florida Today 2017).

There are also plans to add more exhibits of space-flown vehicles, including a SpaceX Dragon capsule that hauled cargo to the International Space Station. There could also be a revamp of the Launch Complex 39 observation gantry into an activity learning center that might include a Mars simulation and a launch viewing center.

A new Installation Development Plan is currently being written that will align the future vision for CCAFS and Patrick Air Force Base with the priority of achieving short- and long-term sustainability of the installation. The 45th Space Wing Mission Statement is "One team…delivering assured space launch, range, and combat capabilities for the Nation" with a vision of becoming the "World's Premier Gateway to Space" (USAF 2017). Future development would be guided by sustainability, and increases in launch tempo and associated support activities would occur sustainably and compatibly with the efficient use of land and energy, the conservation of natural resources and the safe operation of launch vehicles and processing facilities. New facilities and launch complexes would be developed as to minimize any potential impact or compatibility with current facilities and the environment.

SpaceX is building two additional landing pads at Landing Zone 1 (LZ-1), formerly LC-13, on CCAFS to support landing operations. Operations at LZ-1 would include landing of up to three booster stage vehicles, post-flight and landing safing of the vehicles, and Dragon static fire testing.

An abandoned USAF satellite processing area on CCAFS, referred to as Area 59, has been made available by the 45th Space Wing for use by SpaceX. Existing facilities will be re-utilized to support Dragon processing requirements. No major construction will be required. It will support Dragon processing requirements including hypergolic propellant (monomethlyhydrazine [MMH] and nitrogen tetroxide [NTO]) load and offload; post flight and static fire helium and propellant tank ullage venting; and system and component decontamination and checkouts.

SpaceX completed rebuilding LC-40 at CCAFS after the Falcon 9 static fire mishap in September 2016, and saw the successful CRS-13 cargo mission to the ISS in December 2017. LC-40 is needed for Falcon 9 missions so that final elements of work on LC-39A can be completed for Falcon Heavy missions.

Blue Origin proposes to construct and operate an Orbital Launch Site at LC-11 and LC-36 on CCAFS. The facility would support testing of rocket engines, integration of launch vehicles, and launches of liquid fueled, heavy-lift class orbital vehicles.

Moon Express has negotiated an agreement to use LC-17 and LC-18 from the USAF at CCAFS. Several buildings at LC-17 will be renovated including a former spacecraft integration building and an engineering building. Test stands will be constructed to support work for its spacecraft engines. LC-18 will be used as a test flight area for tethered and free-flight tests of Moon Express landers.

Space Florida holds an FAA Launch Site Operator License for LC-46. This allows Space Florida to offer the site for launches of solid and liquid propellant launch vehicles to launch operators for several types of vertical launch vehicles. The proposed launch vehicles and their payloads would be launched into low earth orbit or geostationary orbit. All vehicles are expected to carry payloads, including satellites (FAA 2008, EA for Launch Complex 46). Orbital ATK plans to launch a Minotaur IV rocket from LC-46 in August 2017. LC-46 will also be used by NASA for the Orion Ascent Abort-2 test mission. This mission, scheduled for 2018, will launch an Orion mock-up using a first stage booster from a Peacekeeper missile modified by Orbital Sciences Corporation to demonstrate a successful abort under the highest aerodynamic loads it will experience in flight.

The short-term forecast for CCAFS and KSC includes launches from LC-37B, LC-39A, LC-41, and LC 46. LC-37 is used to launch communications and GPS satellites aboard the Delta IV launch vehicle. A Delta IV Medium launched a communications satellite in March of 2017. A GPS satellite is scheduled to be launched from LC-37 no earlier than 2018.

There were twelve launches of the SpaceX Falcon 9 from LC-39A and one launch from LC-40 in 2017, including ISS resupply missions, a U.S. Government National Reconnaissance Office (NRO) intelligence satellite, the USAF X-37B, and various communications satellites. SpaceX successfully launched the Falcon Heavy rocket on its maiden flight from LC-39A on February 6, 2018.

LC-41 is currently used by United Launch Alliance for Atlas V launches. A USAF payload was launched from LC-41 in January 2017. An Orbital ATK unmanned resupply Cygnus spacecraft was flown from LC-41 to the ISS in April 2017. A communications satellite is scheduled for launch in August as well as an NRO satellite later the same month. There are plans to launch a USAF communications satellite aboard Atlas V in October, and an early warning missile detection system in November to finish out 2017. There is a weather satellite and a USAF payload already scheduled for 2018 along with a military communications satellite to be launched from LC-41 no earlier than 2018. A Minotaur IV rocket is scheduled to be launched from LC-46 in August 2017. This will be the first launch of an Orbital ATK Minotaur rocket from CCAFS. The mission will launch a surveillance satellite for the USAF. LC-46 will also be used by NASA for the Ascent Abort-2 test mission of Orion planned for 2018.

Space Florida proposes to develop a non-federal launch site that is state-controlled and state-managed. Under the Proposed Action, Space Florida would construct and operate a commercial space launch site known as the Shiloh Launch Complex consisting of two vertical launch facilities and two off-site operations support areas. The proposed 80 ha (200 ac) launch complex would accommodate up to 24 launches per year as well as up to 24 static fire engine tests or wet dress rehearsals per year. The vehicles to be launched include liquid fueled, medium- to heavy-lift class orbital and suborbital vertical launch vehicles. FAA is the lead agency in the development of an EIS for the proposed launch site.

The Canaveral Harbor or Port Canaveral is a man-made, deepwater port located on the barrier island north of the City of Cape Canaveral. A summary of the Port's future development plans includes but is not limited to the following paragraphs (Port Canaveral 2017).

Internal road and pier improvements are ongoing and more are planned including replacement of the outdated drawbridge on SR 401. In addition, a SR 528 widening project is tentatively scheduled to start in 2022. The road will be expanded from four to six lanes from Interstate 95 to Port Canaveral to accommodate projected passenger and cargo traffic generated by Port expansion projects.

Connection of Port Canaveral to inland ports via a rail line through NASA and USAF property has been under consideration for several years. The CCAFS-KSC Freight Rail Extension Alignment Feasibility Study was complete in December 2016 and provided to the Surface Transportation Board. Discussions are continuing with a recent change to the proposed action to construct and operate a rail line through CCAFS rather than pursuing the original Banana River-Merritt Island alignment.

A project to deepen the channel to 13 m (44 ft) has been underway since 2005 and is nearing completion. Due to its expanding cargo operations and the construction of larger vessels, the Port has initiated a study looking at the feasibility of deepening the channel.

Cruise ship activity continues to increase with additional homeport ships including some of the largest in the world. Port Canaveral is currently the world's second busiest cruise port for multi-day embarkation. With more travelers taking to the water and new cruise ships continuing to be built, the Port's cruise industry is set to expand even further. Recent developments include the new Cruise Terminal One, and multi-million dollar renovations to Cruise Terminals Five, Eight, and Ten. Carnival, Disney, Royal Caribbean, and Norwegian Cruise lines all sail out of Port Canaveral.

Port Canaveral continues to develop facilities and capacity to become a premier cargo port. The first quarter of 2017 saw significant increases in vehicle, slag, salt and petroleum imports. New cargo services in 2016 include Blue Stream, a weekly container service connecting Central Florida with Europe, Central America and the Caribbean. In 2016 an auto processing company AutoPort opened a 14.7-acre terminal for new vehicles arriving at the docks.

SpaceX has taken on a 5-year lease of the facility located just north of the port at 620 Magellan Road. This facility is designated for multi-purpose operations.

4.2 Cumulative Impact Analysis

Cumulative impacts result from the incremental effect of an action when added to other past, present, and reasonable 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. Past, current, and future launch vehicle processing operations at KSC and CCAFS, along with present and future actions occurring on a regional basis, must be considered when evaluating cumulative impacts. The construction of new facilities and associated infrastructure or modification of existing facilities and infrastructure, and operations associated with the proposed facilities would be consistent with existing KSC activities and pose no new types of impacts.

As described in Section 3, no direct or indirect impacts were identified for cultural resources or environmental justice. When considered with other past, present, and foreseeable future actions, the

Proposed Action would not contribute to any cumulative effects associated with these resource categories and, therefore, were not carried forward for detailed cumulative impacts analysis.

Under the No Action Alternative there would be no change in baseline conditions for the resources evaluated in this EA. Existing conditions at KSC would continue as described in Section 3. No new cumulative impacts would be expected.

4.2.1 Land Use

Development at Roberts Road would be expected to have a moderate cumulative effect on land use due to the undeveloped nature of the area and the required change in land use designation. Currently the land is managed by MINWR for wildlife and habitat diversity. However, relatively few natural areas on KSC are being converted to operational use. Mitigation for impacts to the site could be accomplished through habitat restoration in other degraded areas. There would also be an impact on prescribed burn and wildlife habitat management activities which would require increased coordination between facility operators and MINWR. Processing facility restrictions in KCA-4205 state there will be no prescribed burning on KSC/MINWR that will place smoke within a 2-mile radius of an identified critical spaceflight hardware, payload processing facility or launch site when a smoke-sensitive payload is present. The agreement is being updated and will reduce the smoke restriction to a 1-mile radius. These restrictions, or smoke exclusion buffers currently exist (see maps in Appendix) and are not limited to the Roberts Road site. KSC would mitigate the impacts from these restrictions by working with MINWR and SpaceX to increase prescribed burning opportunities.

Overall, cumulative impacts to land use would be moderate and easily absorbed by consolidation of operations into small geographic 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.

4.2.2 Noise

There would be no significant increase in cumulative impacts from noise in the region due to the Proposed Action. Variations in timing and location of construction activities would result in noise generation being spread out and intermittent, lasting only for the duration of each construction project. Minimal effects of operational activities from use of heavy equipment and processing of spacecraft would contribute to the overall cumulative noise impacts from other noise sources in the area. Industrial activities would be spread out spatially, aircraft operations would be infrequent, and launches would not occur simultaneously, therefore cumulative noise impacts would not be significant.

4.2.3 Biological Resources

The majority of impacts on biological resources from implementation of the Proposed Action would be limited to ruderal habitat on already disturbed land. Disturbance of natural vegetation would be limited to small areas. Minimal impacts to eastern indigo snakes would result from construction activities and would be lessened by mitigation and conservation measures.

The USFWS Biological Opinion (FWS Log No. 04EF1000-2013-F-0194) of the KSC Florida Scrub-Jay Compensation Plan assumes no disruption to prescribed fire planning and implementation. It does not consider impacts in addition to those associated with habitat destruction, which include the inability to regularly burn an area.

No direct cumulative impacts to biological resources due to habitat destruction are anticipated because the project area is highly disturbed and small compared to the amount of suitable habitat available elsewhere on KSC. However, indirect, adverse cumulative impacts would potentially result from the Proposed Action due to increased restrictions on MINWR's ability to conduct prescribed burns on adjacent property.

4.2.4 Air Quality

The most routinely influential air quality fluctuations are created by the emissions from automobiles entering and departing KSC. However, an increase in emissions from traffic due to the Proposed Action and foreseeable actions in the region are not expected to exceed that experienced at KSC in the past or result in cumulative impacts. Also, the atmospheric emissions associated with spacecraft processing activities are brief and sporadic, long-term cumulative air quality impacts in the lower atmosphere are not expected to be significant.

The Proposed Action added to past, present, and reasonably foreseeable actions in the region would result in minimal, temporary increases in air emissions. This incremental contribution to cumulative air quality impacts from the Proposed Action would not be significant.

4.2.5 Climate

Impacts on climate from direct emissions resulting from the Proposed Action are expected to be minimal. Individual sources of anthropogenic greenhouse gas emissions resulting from construction and operations of the SpaceX site alone would not be large enough to accelerate regional climate change. Therefore, contributions from this project would not be significant. An appreciable impact would only result when combined with other greenhouse gas emissions from man-made activities on a global scale.

4.2.6 Hazardous Materials/Hazardous Waste

Although many hazardous materials and wastes are known to accumulate in the environment, it is not expected that there would be any cumulative effects caused by environmental contamination as a result of the Proposed Action. Continued implementation of BMPs for the handling and disposal of hazardous materials and waste in compliance with RCRA regulations would limit the potential for impact. Safeguards would be in place to minimize the release of toxic chemicals in the environment, and rapid spill response plans would ensure that unintended releases would be cleaned up quickly. Therefore, the Proposed Action is not expected to result in cumulative impacts due to hazardous materials and waste.

4.2.7 Water Resources

With the implementation of stormwater management systems, development of the KSC site would have a moderate cumulative effect on hydrology and water quality. Regionally, vegetated lands are increasingly being covered by impervious surfaces (buildings, parking lots, roadways) resulting in increased runoff and limiting replenishment of groundwater. Although stormwater management has been implemented for construction efforts since the 1990s, these retention and detention ponds are generally not able to accommodate large amounts of water associated with heavy rainfall, resulting in some excess runoff flowing into wetlands, ditches, and the IRL. However, quantities are generally episodic and can be absorbed by the lagoon system.

The cumulative adverse effects on surface water quality in the IRL from the development of the Roberts Road site would be moderate. Even with stormwater management plans implemented, heavy rains would

cause runoff from the site. Eventually, stormwater could reach the IRL, although some of the sediment would have settled out and the concentrations of other pollutants would be reduced.

Surface water discharges from the selected site would be managed according to requirements of the SJRWMD conditions for issuance of Environmental Resource Permits. The SJRWMD Applicants Handbook for Management and Storage of Surface Waters, Chapter 10.3 states "The post-development peak rate of discharge must not exceed the pre-development peak rate of discharge, and the peak discharge requirement shall be met for the 25-year frequency storm. In determining the peak rate of discharge, a 24-hour duration storm is to be used". In addition, the SJRWMD requires wet detention systems to be designed in a manner that meets applicable water quality standards in SJRWMD Rule 40C-42.026(4). Water quality impacts to the OFW associated with the IRL and MINWR would be minimized by the design, operation, and maintenance of stormwater management systems that would meet or exceed all requirements of the SJRWMD.

Construction of facilities at the Proposed Action location would be conducted following best engineering practices to minimize hydrologic and water quality impacts onsite and to surrounding areas. Stormwater management plans would be developed with conceptual land use plans to determine site design. Stormwater analyses would be conducted to determine the amount of land necessary to provide adequate treatment and storage capacity for both pre-developed and post-developed conditions. The resulting stormwater storage and treatment areas would help filter much of the suspended solids out of the water percolating into the ground. In addition, the biological and chemical processes that take place in stormwater detention/retention ponds would reduce the amount of contaminants found in runoff, and fewer pollutants would make their way into the water table.

4.2.8 Geology and Soils

No impacts to the geology of KSC would result from the Proposed Action. Therefore no significant incremental impacts to the regional geology would be expected. There would be minimal impact to soils due to construction and land disturbance. Cumulative impacts on soils from construction activities would not be significant as these soils are common locally and regionally.

4.2.9 Transportation

Increases in traffic during construction of the Proposed Action would be short-term with only minimal adverse effects. Increases in traffic and 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.

4.2.10 Utilities

The cumulative effects on utilities and services as a result of Proposed Action activities combined with current and future KSC actions would be moderate. Any changes to utility services such as electrical, communications, natural gas, and solid waste would occur within KSC and result in relatively small cumulative impacts to regional service providers. The future water supply could become more limited. Future operations and personnel could implement water conservation measures and evaluate alternative water sources in order to minimize impacts on this resource.

Upgrades to the KSC and CCAFS infrastructure, beyond the expansion of the domestic wastewater collection/transmission system, may be required for connection to the KSC and CCAFS sanitary sewer

system. These upgrades may include increasing the ability of the KSC domestic wastewater collection/transmission system to transmit, store, and equalize the flow to the CCAFS plant. An increase in the treatment capacity of the CCAFS Regional Wastewater Treatment Plant may be necessary.

4.2.11 Health and Safety

Minimal adverse impacts to worker health and safety during construction and operation of the Proposed Action and cumulative projects would be expected. Contractor and operations personnel would be required to follow and implement OSHA, and NASA safety standards to establish and maintain a safe working environment. There would be no cumulative impacts to worker or public health and safety as a result of the Proposed Action.

4.2.12 Socioeconomics

Cumulative impacts from the Proposed Action would potentially be beneficial to KSC and surrounding communities. There would be increased employment opportunities during construction and operation of the proposed SpaceX site that would eventually ripple out into other businesses and industries in the local communities.

5.0 LIST OF PREPARERS AND CONTRIBUTORS

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

Table 5-1. Preparers of EA

NAME	TITLE	AREA OF CONTRIBUTION
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Table 5-2. Contributors of Information for EA

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Other	
David Thorpe	Community Planner/NASA
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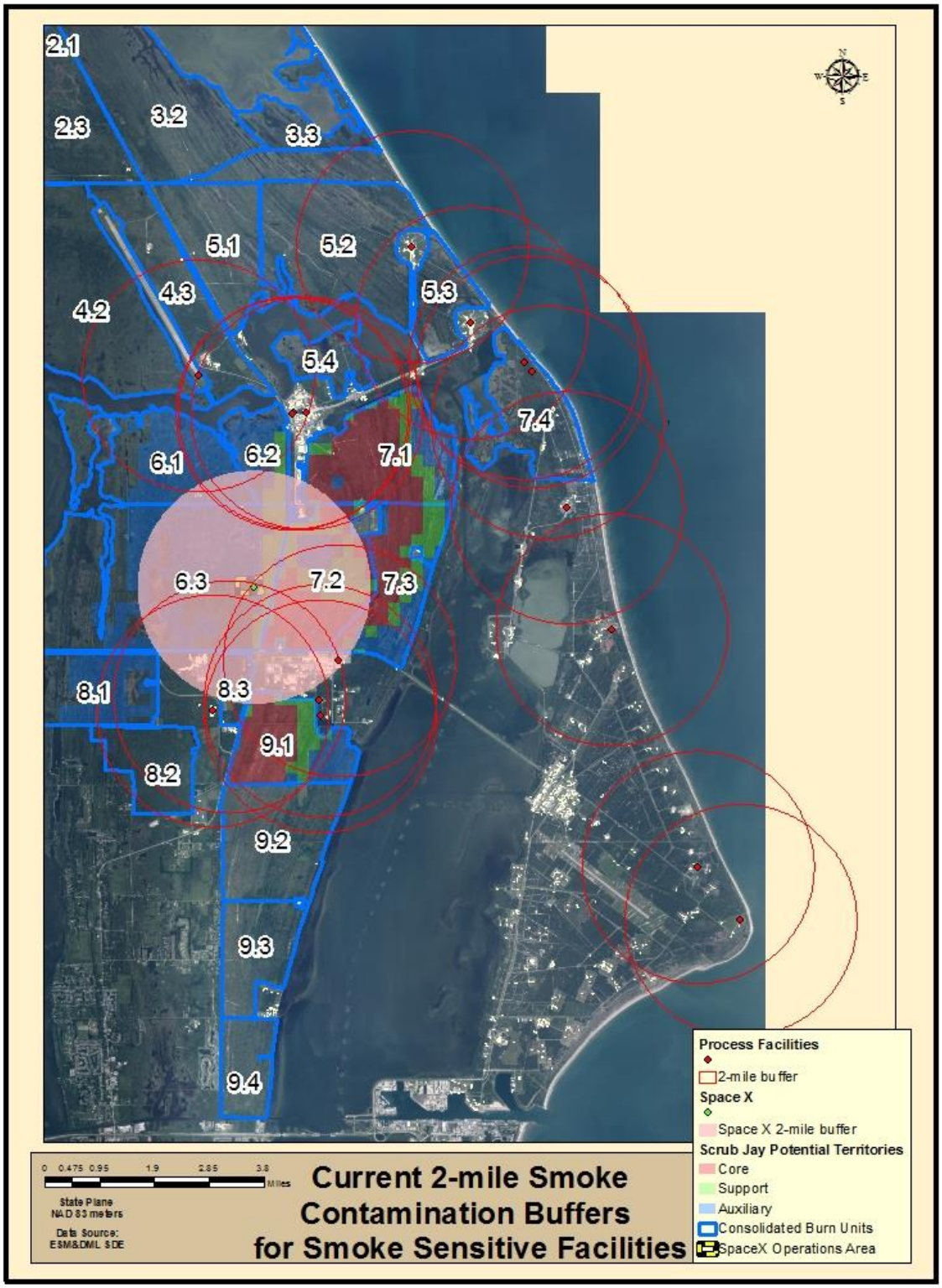
APPENDIX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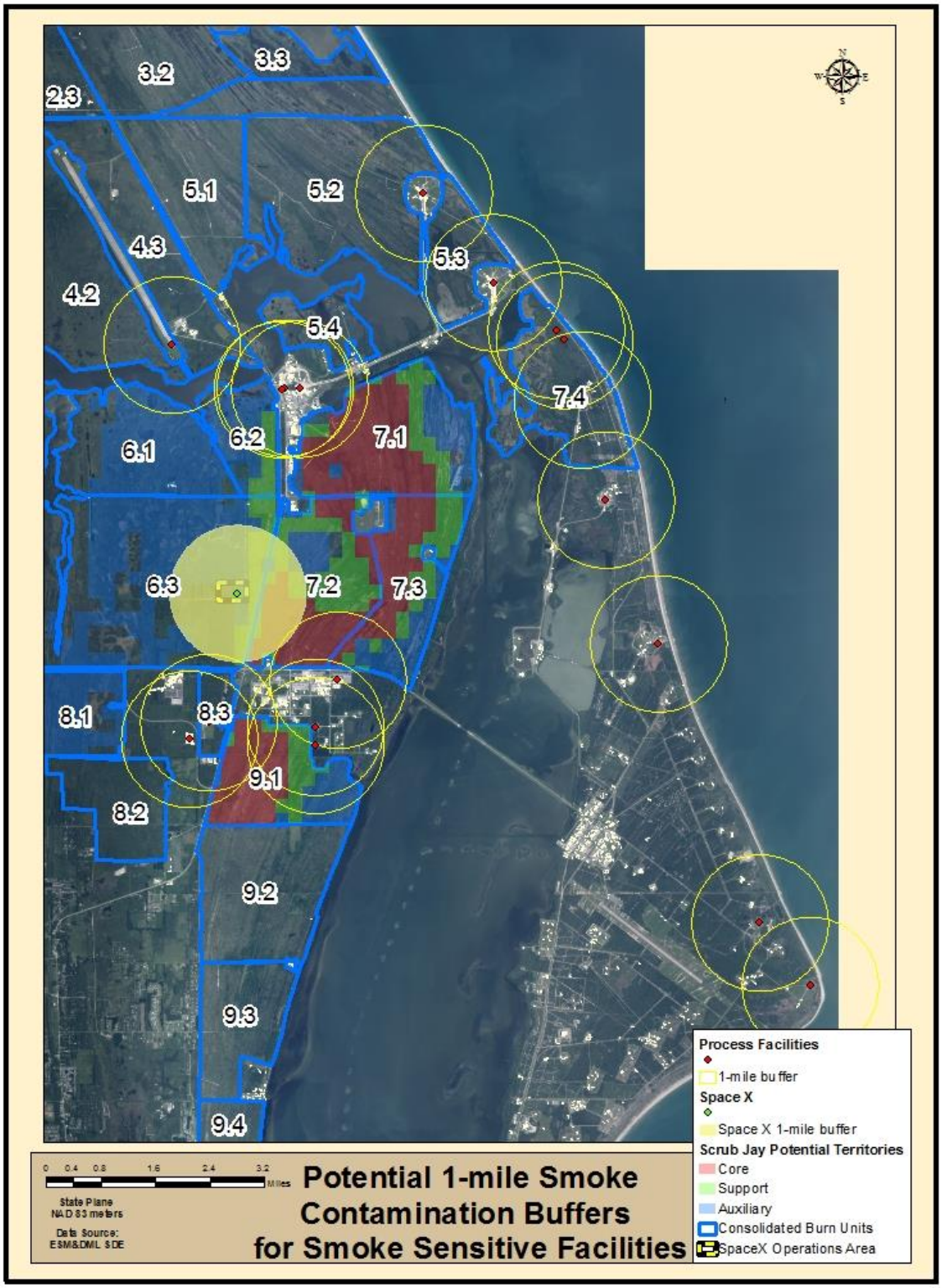
Process Facilities
2-mile buffer
Space X
Space X 2-mile buffer
Scrub Jay Potential Territories
Core
Support
Auxiliary
Consolidated Burn Units
SpaceX Operations Area
0 0.475 0.95 1.9 2.85 3.8
Miles
State Plane
NAD 83 meters
Data Source:
ESM&DML SDE
Current 2-mile Smoke
Contamination Buffers
for Smoke Sensitive Facilities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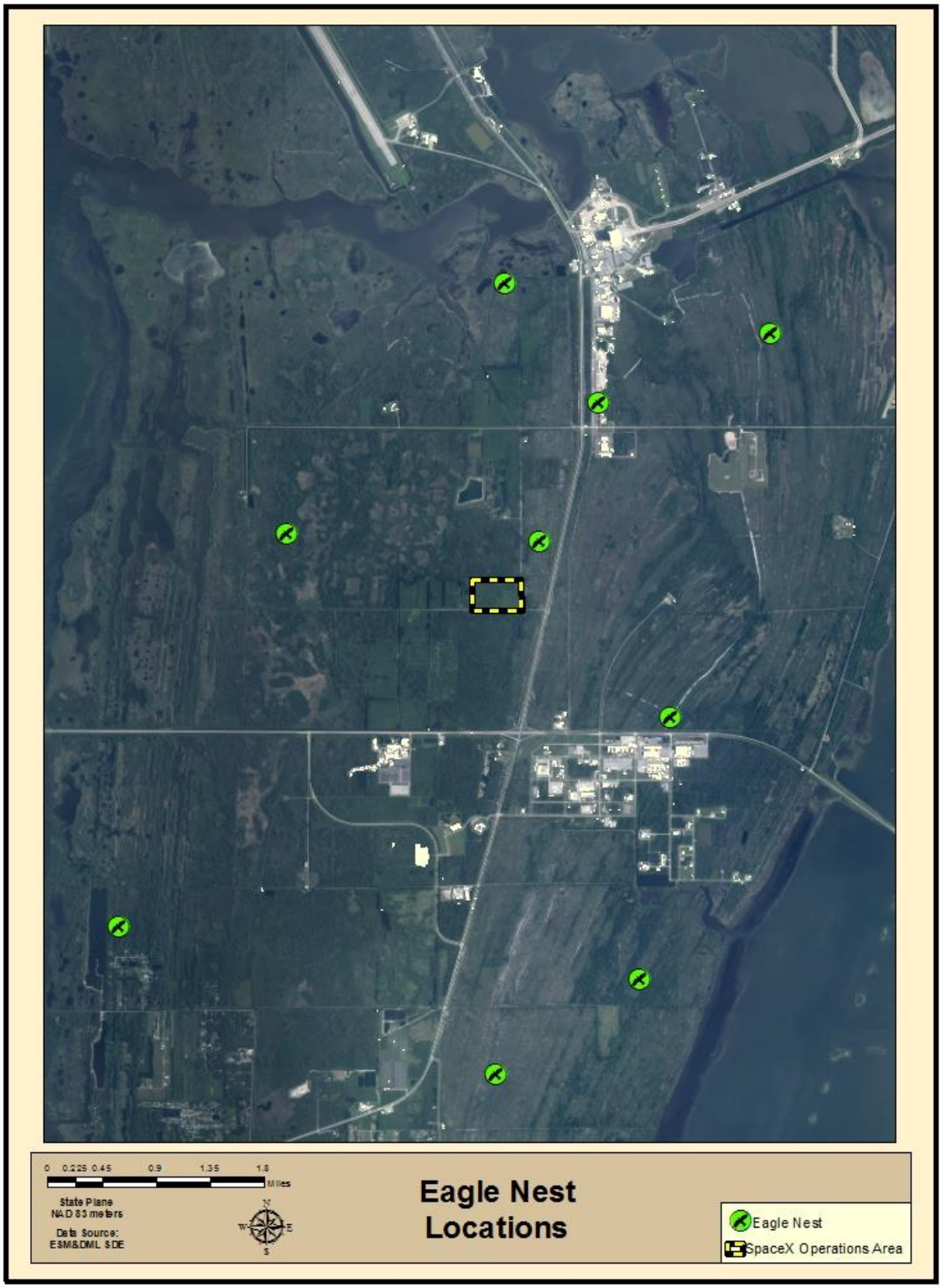
Process Facilities
1-mile buffer
Space X
Space X 1-mile buffer
Scrub Jay Potential Territories
Core
Support
Auxiliary
Consolidated Burn Units
SpaceX Operations Area
0 0.4 0.8 1.6 2.4 3.2 Miles
State Plane
NAD 83 meters
Data Source:
ESM&DML SDE
Potential 1-mile Smoke
Contamination Buffers
for Smoke Sensitive Facilities


0 0.225 0.45 0.9 1.35 1.8
Miles
State Plane
NAD 83 meters
Data Source:
ESM&DML SDE
N
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Eagle Nest
Locations
Eagle Nest
SpaceX Operations Area