National Aeronautics and
Space Administration

Final Programmatic Environmental Assessment for NASA John F. Kennedy Space Center Master Plan

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

February 2026

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NOTICE: KSC-2026-05

National Environmental Policy Act: Kennedy Space Center (KSC) Master Plan Programmatic Environmental Assessment (PEA)

AGENCY: National Aeronautics and Space Administration (NASA)

ACTION: Finding of No Significant Impact (FONSI)

SUMMARY: Pursuant to the National Environmental Policy Act of 1969 (NEPA), as amended (42 U.S.C. 4321 et seq.); NASA policy and procedures (14 CFR Part 1216 et seq.); and the NASA Procedural Requirements (NPR) for Implementing NEPA and Executive Order 12114 (NPR 8580.1), NASA has prepared an PEA to evaluate the potential impacts on the natural and human environment associated with the Proposed Action. The Proposed Action would implement a phased approach to facility construction, demolition, renovation, and infrastructure upgrades identified in the Area Development Plans (ADPs) for the Exploration Launch District, the Vehicle Assembly Building (VAB) District, and the Central Campus/Processing District, along with a Parcel Opportunity Analysis (POA) and a Center Development Plan (CDP). The Proposed Action would support and enhance KSC with flexible processing and launch capabilities, robust infrastructure, and sustainable facilities over the next 20 years.

DATE: This proposed action may proceed as of the date of signature of this FONSI.

ADDRESSES: Written comments or questions should be addressed to:

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A copy of the final PEA is available by contacting Mr. Brooks at the address above, electronic mail address, or telephone indicated herein.

PUBLIC and STAKEHOLDER ENGAGEMENT: The PEA and FONSI are available on the KSC public facing website: https://public.ksc.nasa.gov/environmental/nepa-documents/. NASA also provided the draft PEA to the Florida State Clearinghouse for review.

DESCRIPTION OF THE PROPOSED ACTION: This PEA addresses the No Action Alternative and the Proposed Action of implementing a Center Master Plan (CMP) detailing a phased approach to facility construction, demolition, renovation, and infrastructure upgrades at KSC, Florida. The Center Master Plan comprises the ADPs, the POA, and the CDP. Because this PEA evaluates impacts at a programmatic level, subsequent project-specific actions implementing the ADPs, POA, or CDP that fall outside the scope or impact thresholds analyzed in the PEA, or that present site-specific conditions not addressed in the analysis, will be subject to additional NEPA review and tiered from this PEA, as appropriate.

Under the No Action Alternative, KSC would not implement a Center Master Plan. This would remove guidelines for real property decision-making and hinder implementation of the 2025 KSC Master Plan. KSC would continue to operate the buildings and infrastructure currently in use within the Central Campus/Processing, Exploration Launch, and VAB Districts.

ENVIRONMENTAL CONSEQUENCES: The PEA evaluates the portions of the KSC environment relevant to the Proposed Action and the No Action Alternative. Assessed resource areas include transportation, utilities, air quality, land use, biological and cultural resources, geology and soils, noise, water resources, and socioeconomics. Potential impacts were identified and classified as none, negligible, or minor.

Construction activities under the Proposed Action would result in minor impacts to biological resources, water resources, cultural resources, utilities and infrastructure, and land use. Negligible impacts would occur to air quality, and hazardous materials and waste.

During operations, the Proposed Action would result in minor effects in biological resources, air quality, and water resources. Negligible impacts would occur to cultural resources, hazardous materials and wastes, land use, and utilities and infrastructure. Some beneficial impacts would occur to water resources, utilities and infrastructure and land use.

CONCLUSION: Based on the analysis in the final PEA, and the implementation of best management practices, NASA has determined that the environmental impacts associated with implementing the Proposed Action would not result in a significant effect on the natural, biological, or physical environment. Applicable federal, state, and local laws and regulations will be followed. This FONSI incorporates by reference the PEA and provides the necessary analysis for concluding that an Environmental Impact Statement pursuant to NEPA is not required, and this FONSI is hereby submitted.

RESPONSIBLE OFFICIAL:

Brian Hughes Digitally signed by Brian Hughes
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Brian Hughes
Director, NASA John F. Kennedy Space Center

FINAL PROGRAMMATIC ENVIRONMENTAL ASSESSMENT FOR NASA JOHN F. KENNEDY SPACE CENTER MASTER PLAN

Lead Agency: National Aeronautics and Space Administration (NASA)

Proposed Action: Kennedy Space Center (KSC) Master Plan

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Date: February 2026

Abstract: NASA proposes to implement a Center Master Plan (CMP) that guides future development and investments at KSC. In accordance with the National Environmental Policy Act (NEPA), NASA has prepared the KSC CMP Programmatic Environmental Assessment (PEA) to evaluate the potential environmental effects of implementing a phased approach to facility construction, demolition, renovation, and infrastructure upgrades identified in Area Development Plans (ADPs) for the Exploration Launch District, Vehicle Assembly Building (VAB) District, and Central Campus/Processing District, along with a Parcel Opportunity Analysis (POA) and Center Development Plan (CDP). The Proposed Action would support and enhance KSC with flexible processing and launch capabilities, robust infrastructure, and sustainable facilities over the next 20 years. The potential effects to numerous resource areas resulting from the implementation of NASA's Proposed Action and No Action Alternative are presented.

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EXECUTIVE SUMMARY

Summary of Potential Effects to Resource Areas		
Resource Area	**No Action**	**Proposed Action**
Air Quality	The Proposed Action would not occur. There would not be new emissions associated with construction activity, and there would be no effect to air quality.	Effects to air quality from construction of projects under the Proposed Action would negligible and would occur in temporary phases over the 20-year planning period. There would be increases in regulated air pollutants in the immediate area of sites during the removal of vegetation and exposure of topsoil and from heavy machinery exhaust. This would temporarily affect local air quality, with particulate matter being the greatest emission. These emissions would be mitigated using standard processes typically used for construction projects – watering for dust control, limitations of activity during high wind periods, and idling restrictions as examples. Operational effects would largely increase, as many of the projects over the 20-year horizon are based on development for increased capacity at KSC. The additional development of LC-48 would expand launch capacity and the effects of that are not currently known. Use of LC-48 would require its own NEPA analysis once the specific vehicles to be used and frequency of use are known. Projects that are slated for development to increase contractor presence would ultimately increase the population of workers reporting to KSC and so commuter emission increases would be anticipated. Though the scale is not known, it would be evaluated as part of the follow-on project evaluations that would be implemented when development planning has become further evolved. Overall, implementation of the Proposed Action would be minor and not result in significant effects to air quality.

Summary of Potential Effects to Resource Areas		
Resource Area	**No Action**	**Proposed Action**
Biological Resources	The Proposed Action would not occur, and there would be no change to biological resources. No effects would occur on biological resources at KSC with the implementation of the No Action Alternative.	Effects to biological resources from construction activities would be temporary and minor, with some potential for long-term effects. Vegetation within the Project Area would be removed and trampled from construction activities, resulting in permanent habitat loss in some areas. Benthic resources and SAV within the waters of KSC may be negatively impacted from water quality degradation associated with activities under the Proposed Action. Overall effects to vegetation would be minimized by reducing the area of disturbance through BMPs. While wildlife and special status species are expected to avoid areas with construction activities and would utilize nearby suitable habitats, displaced wildlife may be unable to utilize adjacent areas if they are unsuitable or already at carrying capacity, leading to elevated mortality. The majority of effects to biological resources would occur during construction. Once construction is completed, operational activities associated with the Proposed Action would have minor effects on vegetation, wildlife, and special status species from increases in noise, lighting, and increased human presence. Overall, implementation of the Proposed Action would result in insignificant short-term construction and insignificant long-term operational effects on biological resources at KSC.
Water Resources	The Proposed Action would not occur, and there would be no change to water resources. No effects would occur on water resources in and around KSC with the implementation of the No Action Alternative.	Effects to water resources from construction activities associated with the Proposed Action at KSC would be minor and temporary. Construction activities can cause increased erosion and sedimentation runoff, affecting the integrity of nearby wetlands, surface water, ground water, floodplains, and the coastal zone. Some of the proposed projects call for substantial vegetation clearing in watersheds, new roads, and miles of powerlines though marshes. BMPs would be applied where applicable, and construction activities would be in compliance with all applicable permitting regulations. Additionally, some planned improvement projects would reduce erosion, sediment, and nutrient inputs, including stormwater treatment infrastructure and elevating roadways at risk of erosion and flooding, providing positive benefits. Therefore, both positive and minor negative effects would be expected to water resources once construction activities are completed under the Proposed Action.

Summary of Potential Effects to Resource Areas		
Resource Area	**No Action**	**Proposed Action**
Cultural Resources	The Proposed Action would not occur, and there would be no change to cultural resources. Therefore, no effects on cultural resources would occur with implementation of the No Action Alternative.	Implementation of the Proposed Action may result in adverse effects to cultural resources from construction activities. Once a project is approved, licensed, or permitted by KSC, KSC will ensure compliance with federal regulations and laws. KSC would follow procedures established in the Integrated Cultural Resources Management Plan (ICRMP) (NEMCON, 2024) or any subsequent version thereof. Adverse effects would be resolved in accordance with the processes outlined in KSC's Programmatic Agreement governing Section 106 review and would be done in consultation with the SHPO, Tribal Nations, and consulting parties, as required. No operational effects to cultural resources are expected once the construction of the Proposed Action has been completed.
Hazardous Materials and Wastes	The Proposed Action would not occur; there would be no change to the storage, use, or management of hazardous materials and wastes.	No significant effects on the management and use of hazardous materials would be expected. Hazardous materials usage during construction activities would be temporary and managed in accordance with federal and state regulations and KNPR 8500.1D, *Kennedy Space Center Environmental Requirements*. Under the Proposed Action, several proposed projects involve potential ground-disturbing activities that are located in areas with Land Use Controls (LUCs). Implementation Plans have been developed for each site with LUCs and are managed by the Remediation Group of the KSC Environmental Assurance Branch. Each site is inspected quarterly, and annual reports are submitted to USEPA to certify compliance with the established controls. Any activities that may impact the effectiveness of the LUC, such as excavation or other construction that may disturb or encounter contaminated soil or groundwater, require approval by USEPA and Florida Department of Environmental Protection (FDEP). Procedures are currently in place for the proper use, storage, transportation, and disposal of hazardous materials, and the proper control and minimization of hazardous waste releases at KSC. No effects on the management of hazardous materials and hazardous wastes would be expected as no substantial change in hazardous waste operations would be anticipated as a result of the Proposed Action.

Summary of Potential Effects to Resource Areas		
Resource Area	**No Action**	**Proposed Action**
Land Use	The Proposed Action would not occur, and there would be no changes to existing land use at KSC. No effects to land use would occur with the implementation of the No Action Alternative.	During construction, effects to land use are expected to be temporary and negligible. No changes to land use are expected for construction occurring on previously disturbed land, except for demolition projects that may alter land use. Once construction activities are completed, projects created on previously undisturbed areas would result in long-term environmental changes to land use (and loss of habitat). Operations associated with the Proposed Action would be consistent with permitted land use within the Central Campus/Processing, VAB, and Exploration Launch Districts. Effects to land use at KSC would be expected to be negligible under the Proposed Action, and effects may be both positive and negative.
Utilities and Infrastructure	The Proposed Action would not occur, and there would be no changes to utilities and infrastructure at KSC. No effects to utilities and infrastructure would occur with the implementation of the No Action Alternative.	During construction, minor effects would occur from temporary service disruptions required for upgrades and repairs. Long-term operational effects would occur on stormwater through an increase of impervious surfaces. However, upgrades to stormwater infrastructure and the construction of LEED-certified efficient buildings would have positive long-term benefits to energy and stormwater at KSC. Any impacts from increased demand for electrical power, potable water, and wastewater systems would be minimized with improvements to these systems. Therefore, the Proposed Action would have minor, short-term effects during construction activities and long-term, beneficial effects during operational activities at KSC.

Legend: BMP = Best Management Practice; KNPR = Kennedy NASA Procedural Requirements; KSC = Kennedy Space Center; LEED = Leadership in Energy and Environmental Design; LUC = Land Use Controls; SHPO = State Historic Preservation Officer; USEPA = United States Environmental Protection Agency; VAB = Vehicle Assembly Building.

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ACRONYMS AND ABBREVIATIONS

ACHP	Advisory Council on Historic Preservation
ACM	asbestos-containing material
ADP	Area Development Plan
AMP	Agency Master Plan
APE	Area of Potential Effect
AQCR	Air Quality Control Region
BGEPA	Bald and Golden Eagle Protection Act
BMP	Best Management Practice
CAA	Clean Air Act
CCAFS	Cape Canaveral Air Force Station
CCSFS	Cape Canaveral Space Force Station
CCD	Coastal Zone Consistency Determination
CDP	Center Development Plan
CFR	Code of Federal Regulation
CMP	Center Master Plan
CANA	Canaveral National Seashore
CO	carbon monoxide
CO_2	carbon dioxide
CWA	Clean Water Act
CZMP	Coastal Zone Management Plan
EA	Environmental Assessment
EAB	Environmental Assurance Branch
EMB	Environmental Management Branch
EO	Executive Order
ERP	Environmental Resource Permit
ESA	Endangered Species Act
FC	Federal Candidate
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FE	Federally Endangered
FEMA	Federal Emergency Management Agency
FT	Federally Threatened
FT (S/A)	Federally Threatened Similarity of Appearance
ft^2	square feet
FONSI	Finding of No Significant Impact
GHG	greenhouse gas
GSF	gross square feet
ICRMP	Integrated Cultural Resources Management Plan
KNPR	Kennedy NASA Procedural Requirements
KSC	Kennedy Space Center
kV	kilovolt
LBP	lead-based paint
LC	Launch Complex
LEED	Leadership in Energy and Environmental Design
LF	linear feet
LID	low impact development
LNG	liquefied natural gas
LOS	line of sight
LUC	Land Use Control
LUCIP	Land Use Control Implementation Plan
MINWR	Merritt Island National Wildlife Refuge
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOx	nitrogen oxides
NO_2	nitrogen dioxide
NPDES	National Pollutant Discharge Elimination System
NPR	NASA Procedural Requirements
NPS	National Park Service
NRHP	National Register of Historic Places
O_3	ozone
Pb	lead
PCB	polychlorinated biphenyl
PE	Proposed Endangered

PEA	Programmatic Environmental Assessment
PFAS	polyfluoroalkyl substances
$PM_{2.5}$	particulate matter equal to or less than 2.5 microns in diameter
PM_{10}	particulate matter equal to or less than 10 microns in diameter
POA	Parcel Opportunity Analysis
ppb	parts per billion
ppm	parts per million
PRL	Potential Release Location
RCRA	Resource Conservation and Recovery Act
REC	Record of Environmental Consideration
ROI	Region of Influence
SGB	Spaceport Growth Boundary
SHPO	State Historic Preservation Officer
SLD	Space Launch Delta
SLF	Shuttle Landing Facility
SOP	Standard Operating Procedure
SO_2	sulfur dioxide
ST	State Threatened
SWMU	Solid Waste Management Unit
SWPPP	Stormwater Pollution Prevention Plan
TCP	Traditional Cultural Place
tpy	tons per year
U.S.	United States
U.S.C.	U.S. Code
USEPA	U.S. Environmental Protection Agency
USSF	U.S. Space Force
USFWS	U.S. Fish and Wildlife Service
VAB	Vehicle Assembly Building
VOC	Volatile Organic Compound
WMO	Waste Management Office
$\mu g/m^3$	micrograms per cubic meter

1.0 PURPOSE OF AND NEED FOR PROPOSED ACTION

1.1 INTRODUCTION

The National Aeronautics and Space Administration (NASA) prepared this Programmatic Environmental Assessment (PEA) to evaluate the potential environmental effects of implementing a Center Master Plan (CMP). The CMP would guide future development and investments at the John F. Kennedy Space Center (KSC) with a phased approach to facility construction, demolition, and renovation; infrastructure upgrades; and divestments/outgrants in the Central Campus/Processing District, Exploration Launch District, and Vehicle Assembly Building (VAB) District. The Proposed Action would support existing and future KSC goals and objectives with a focus on reducing real property assets and operating costs over the next 20 years as KSC continues evolving toward becoming a multi-user spaceport. Existing planning districts excluded from this PEA include the Space Commerce District, the Shuttle Landing Facility District, and the Mosquito Lagoon District since these districts have PEAs ongoing or contain no projects identified in the CMP. NASA is the lead agency for this PEA; cooperating agencies include United States (U.S.) Fish and Wildlife Service (USFWS), Merritt Island National Wildlife Refuge (MINWR); National Park Service (NPS), Canaveral National Seashore (CANA); and U.S. Space Force (USSF) Space Launch Delta 45 (SLD 45).

This KSC CMP PEA was prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 (42 U.S. Code [U.S.C.] 4321-4370), as amended by the Fiscal Responsibility Act of 2023 (Public Law 118-5), NASA's Procedures for Implementing NEPA (14 Code of Federal Regulation [CFR] Part 1216), and NASA Procedural Requirements (NPR) 8580.1A, "Implementing the National Environmental Policy Act and Executive Order (EO) 12114."

Programmatic NEPA documents are broad in scope and may be followed by more site- or action-specific NEPA documents as appropriate. This PEA addresses the most reasonably foreseeable actions in three planning districts at KSC within a 20-year planning horizon. The actions listed in this PEA are for long-term planning purposes and do not commit NASA to funding these actions in the future. The PEA provides stakeholders, the public, and decision makers with information necessary to understand and evaluate the potential environmental consequences of the activities included under the Proposed Action.

1.2 LOCATION

KSC is located in Brevard County, Florida approximately 45 miles east of Orlando (**Figure 1.2-1**). KSC occupies Merritt Island, which is surrounded by the Banana River, Mosquito Lagoon, Indian River, and the Atlantic Ocean. KSC is composed of 141,829 acres; much of that land acreage is low-lying wetland or scrubland with significant areas of water. Approximately 90 percent of KSC's property remains undeveloped with only five percent (roughly 7,500 acres) designated for NASA's space flight operations. The undeveloped property at KSC, including the MINWR (which occupies the same property as KSC) and the CANA, is managed in part by the USFWS and the NPS (NASA KSC, 2020a). Regional access is provided from the north and south via Interstate 95 or U.S. Highway 1. Five roads provide access onto KSC with NASA Parkway West (State Route 405) serving as the primary entry/exit access point for personnel, visitors, and cargo.

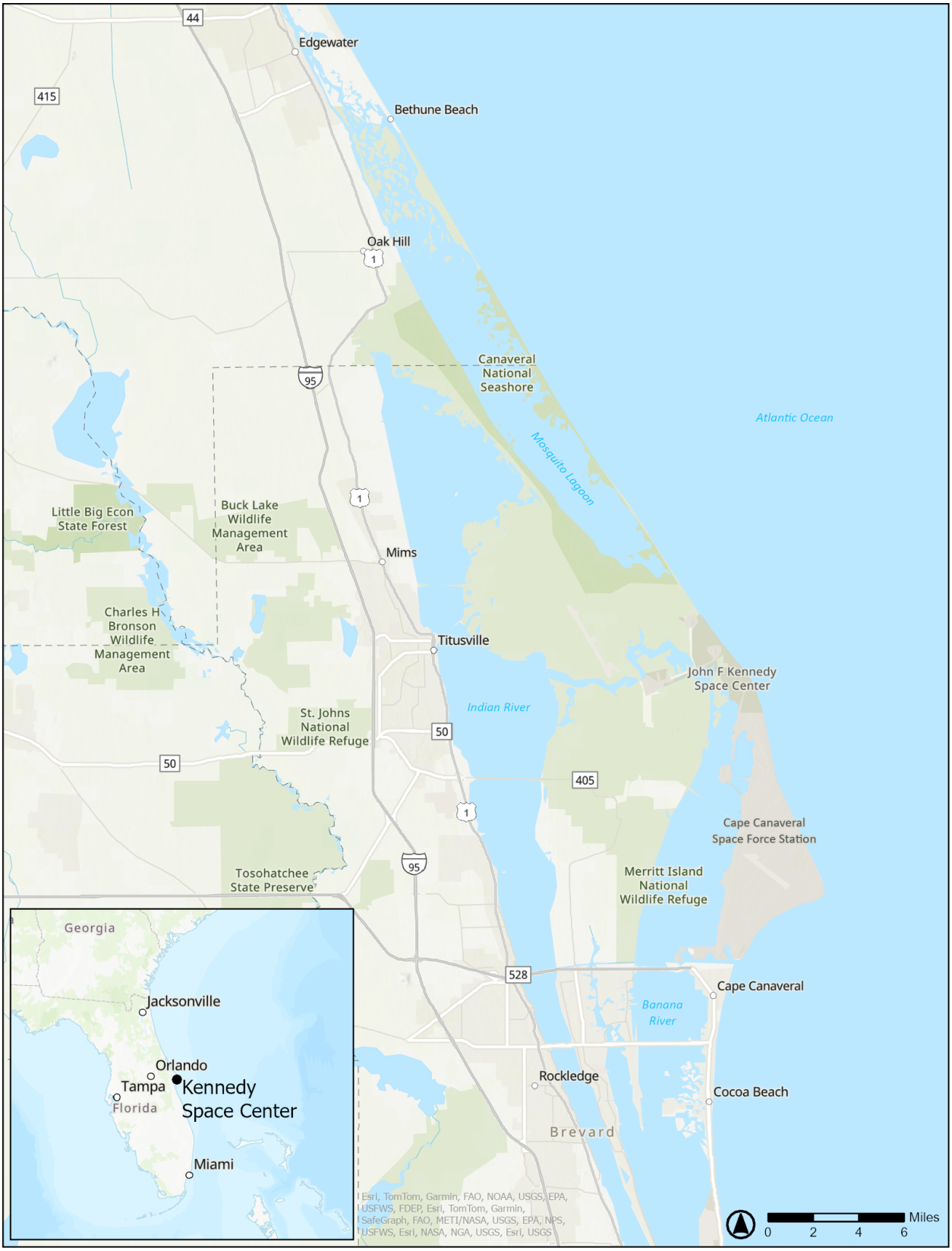


Figure 1.2-1. Location of NASA Kennedy Space Center

1.3 BACKGROUND

1.3.1 KSC Planning Districts

The NASA Spaceport Growth Boundary (SGB) at KSC encompasses approximately 7,500 acres of land where current and future development can occur as illustrated in **Figure 1.3-1**. KSC is divided into six planning districts - each district encompasses NASA-owned facilities and infrastructure, commercial campuses, and the preserved lands of CANA and MINWR. Each planning district has a growth boundary that defines the limits of future development within the environmental and operational constraints and land use patterns of that district. NPR 8810.1A, *Center Master Planning*, establishes the requirement for each NASA Center to develop and maintain a CMP in accordance with NASA Policy Directive 8810.2, *Master Planning for Real Property*.

1.3.2 Planning Documents Prepared by KSC

The *KSC Master Plan 2012-2032* describes a 20-year transformation from a single, government user Launch Complex (LC) to a multi-user spaceport with a focus on development of land assets that would incorporate operational and safety regulation requirements while also preserving and protecting environmentally sensitive areas (NASA KSC, 2017b). Since 2013, the following planning documents have been prepared for KSC that support and update the *KSC Master Plan 2012-2032*:

- 2014 *Study for Implementation Strategies for the Vision 2032 Master Plan* included a plan for consolidation of KSC property progressing the transition into a multi-user spaceport (HuntonBrady Architects, 2014).
- 2016 *Center-wide Operations Programmatic Environmental Impact Statement* evaluated the potential environmental impacts of implementing proposed operations, activities, and facilities over a 20-year planning horizon (2012-2032) of the *Kennedy Space Center Master Plan* (NASA KSC, 2016). In 2017, a record of decision announced the selection of Alternative 1 which would allow for implementation of the CMP and the continuing evolution of KSC toward a multi-user spaceport (NASA KSC, 2017a).
- 2019 *Infrastructure Assessment Study - Civil* was prepared to assess the ability of key infrastructure to support growth of KSC to a multi-user spaceport into 2034. The findings indicated improvements would be required to support the projected user population of 18,900 (JonesEdmunds, 2019).
- 2020 *Vision Plan and Programmatic Environmental Assessment* included goals and objectives that would support flexible processing and launch capabilities with robust infrastructure, sustainable facilities, defined planning districts, and established growth boundaries within each district to concentrate development (NASA KSC, 2020a). A Finding of No Significant Impact (FONSI) was signed on September 2, 2020 (NASA KSC, 2020b).
- The *2024 Framework Plan* builds off the 2020 Vision Plan and prioritizes critical future NASA infrastructure needs and divestments to ensure Agency Master Plan goals are met.
- Three 2024 *Area Development Plans* (ADPs) are the next step of the KSC master planning process following the Vision Plan. Stakeholders considered the Vision Plan and other NASA planning documents during development of the ADPs that will further guide KSC's development over the 20-year planning horizon in support of NASA's mission requirements. The ADPs document the stakeholder-driven planning processes and resulting recommendations (NASA KSC, 2024a, 2024b, 2024c) and were developed consistent with the goals and objectives of the 2020 Vision Plan that includes preservation of natural habitats and development within previously disturbed areas.

- The 2024 *Parcel Opportunity Analysis (POA)* identifies future site layouts, infrastructure requirements, and other development considerations that should be taken into account to facilitate future growth on high-demand parcels identified in the ADP.
- The 2024 *Center Development Plan (CDP)* focuses on strategies that KSC should implement to support evolving NASA and commercial requirements. The projects identified in the CDP are accounted for in the ADPs and intended to link activities that span multiple districts.

1.3.3 Planning Documents Prepared by Others

The 2023 NASA *Agency Master Plan (AMP) Programmatic Environmental Assessment* was prepared at the NASA agency level to assess the environmental effects of implementing the NASA AMP. The AMP is intended to consolidate the framework of NASA's operational needs throughout all 10 Centers over the next 20 years. The AMP will allow NASA to effectively: manage assets and capabilities; provide a unified approach to planning and decision-making; allocate funding and resources; deploy sustainable best practices; reduce present and future risks and redundancies in Center infrastructure; ensure appropriate consideration to environmental constraints; and ensure compliance with applicable federal, state, and local laws, including EOs and Agency directives (NASA, 2023).

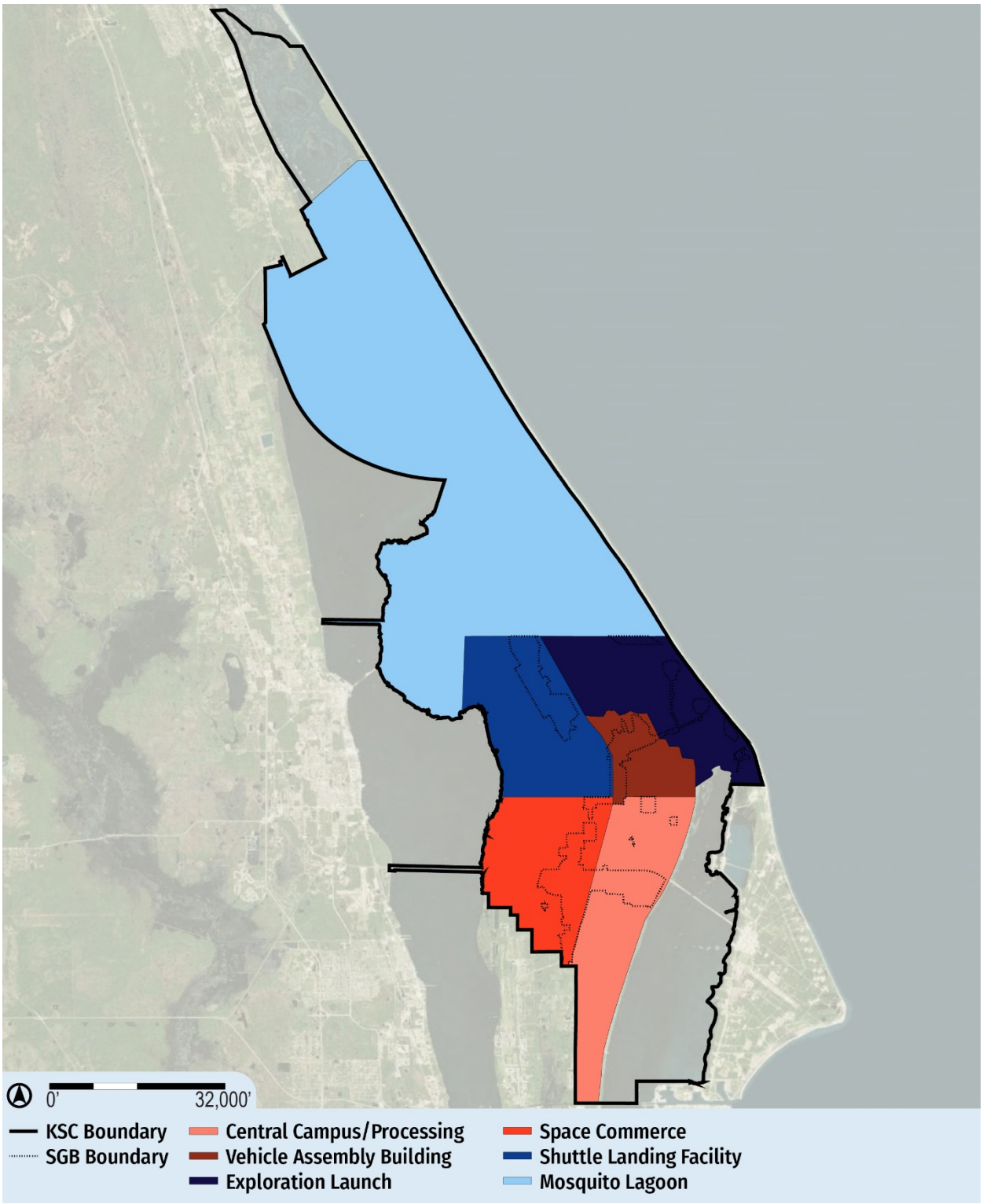
The 2017 *Space Florida Cape Canaveral Spaceport Master Plan* is a living document prepared and updated as needed by Space Florida. The document describes the multi-sector space transportation complex that encompasses the boundaries of KSC (federal), the Cape Canaveral Space Force Station (CCSFS) (federal), and the facilities and infrastructure that Space Florida develops, owns, or manages under property agreements with both NASA and the USSF (Space Florida, 2017).

The 2022 *Cape Canaveral Space Force Station District Development Plan* considered infrastructure improvements within developable areas in support of Space Force mission requirements (USSF, 2022). The USSF owns, or has a permit with NASA for, the real property where the infrastructure improvements would occur. Space Force prepared an EA that evaluates the potential impacts from the proposed infrastructure improvements as described in the District Development Plan. The findings in the *Environmental Assessment for Eastern Range Planning and Infrastructure Development at CCSFS* indicate no significant impact with the application of the USFWS-approved mitigation and conservation measures as described in the EA (USSF, 2024).

The 2024 *Delaware North Master Plan* includes a 15-year development plan at the KSC Visitors Complex that would also occur in the Space Commerce District.

The 2025 *Space Commerce ADP* was prepared by Space Florida on behalf of NASA to identify future commercial space operations, capabilities and supporting infrastructure that could occur in the Space Commerce District.

The USFWS MINWR was established in 1963, through an agreement with NASA, to manage the undeveloped property at KSC and protect migratory birds. In 2007, the USFWS prepared the *Merritt Island National Wildlife Refuge Comprehensive Conservation Plan* to address priority issues raised by USFWS, the Florida Fish and Wildlife Conservation Commission, other governmental partners, and the public. A FONSI for implementation of the Plan was published on August 12, 2008 (USFWS, 2008).



Legend: KSC = Kennedy Space Center; SGB = Spaceport Growth Boundary

Figure 1.3-1. NASA KSC Planning Districts

1.4 PURPOSE AND NEED

The purpose of the Proposed Action is to enhance the multi-user spaceport with flexible processing and launch capabilities, robust infrastructure, and sustainable facilities via implementing a phased approach to facility construction, demolition, and renovation; infrastructure upgrades; and divestments/outgrants in the three planning districts (Central Campus/Processing District, Exploration Launch District, and VAB District). The Proposed Action is needed to support KSC's core capabilities to meet existing (i.e., short-term) and future (i.e., mid- to long-term) NASA and non-NASA operational mission requirements over the next 20 years.

1.5 PUBLIC AND STAKEHOLDER INVOLVEMENT

KSC held a virtual stakeholder scoping meeting on April 23, 2025, to share information about the PEA for the proposed implementation of the CMP and to request comments on proposed projects presented in the ADPs, POA, and CDP. Participants included USFWS, NPS, USSF, U.S. Navy Strategic Systems Programs, Florida Department of State, Florida Division of Historical Resources, Florida Department of Transportation (FDOT), City of Titusville, Space Florida, Space Coast Transportation Planning Organization, Economic Development Commission of Florida's Space Coast, Port Canaveral, Florida Power and Light, and Delaware North.

The EA and FONSI will be available on the KSC public facing website:
https://public.ksc.nasa.gov/environmental/nepa-2

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

The Proposed Action would implement a phased approach to facility construction, demolition, renovation, infrastructure upgrades, and divestment/outgrants of buildings and/or land areas within the Central Campus/Processing District, Exploration Launch District, and VAB District, along with other projects identified in the POA and CDP. This includes any future development and any anticipated commercial development at KSC within these three districts, which are areas where NASA-owned development is being prioritized. ADP project implementation phases would include short-term (0-5 years), mid-term (6-10 years), and long-term (11-20 years). Since the Proposed Action addresses long-term planning over 20 years, implementation of specific projects within each district's ADP may change or vary based on future mission needs and funding. Also included in the analysis are "capacity" projects, those projects intended to enhance or expand beyond the current capabilities but with currently undefined phasing or funding sources.

Short-term phasing projects include those that are mission-critical and can be funded and implemented quickly. Sometimes, these projects may be components of more complex or larger projects that will be completed in the mid- or long-term timeframes. Project or action-specific comprehensive NEPA review would be conducted as appropriate for all projects whether they are short-term or phased projects that have longer timeframes. Mid-term phasing projects include those mission-critical projects that require more time to acquire approval and funding and projects that span multiple years or cannot be started until another project is completed. Long-term projects include those that happen over multiple years, require other projects to be completed before the project can be started, or projects that are mission-critical but have a lower priority than other projects. Short-term and mid-term projects will rely on independent utilities and may be upgraded or enhanced after the implementation of project identified as a long-term project. For example, demolition of facilities programmed for Central Campus Headquarters Phase 2 may not be implemented until new construction is complete.

The following provides a general description of the type of activities associated with the Proposed Action.

Construction activities associated with new buildings, structures, and infrastructure may include site preparation and excavation; construction of the foundation, structural components, and the building shell; completion of the interior spaces, support equipment, and utilities; stormwater management system upgrades; and final grading and landscaping. Infrastructure upgrades could include relocation and/or replacement or upgrade of underground utilities, either buried or conveyed through tunnels, or aboveground utility projects such as replacing transformers, upgrading substations and electric power supplies, replacing lighting and alarm systems, and installing utility metering. Other activities could include removal, repair, and installation of roadways, sidewalks, and parking lots; landscaping modifications to include planting or removing trees and vegetation; installation of retention ponds; and modifying the landscape grade. Federal projects that involve the development of over 5,000 square feet (ft^2) (0.1 acre) are required to maintain or restore the predevelopment hydrology of a project site through development and use of low impact development methods per Unified Facilities Criteria 3-210-10N, *Low Impact Development* (UFC 2023). Construction activities should be directed toward previously disturbed sites.

Renovation could involve some demolition of building interiors and other components followed by construction/installation of new components and equipment.

Demolition projects typically include identifying hazardous and salvageable/recyclable materials; developing a demolition plan; disconnecting utilities and securing the site; removing and disposing of hazardous chemicals and materials located within the building; draining oil or fluid-filled equipment; removing artifacts; salvaging any unique architectural elements for future reuse or display; demolishing/deconstructing structures; and performing final site cleanup, grading, and site re-vegetation.

Divestment could involve outgrants or transfer of interest in excess property to a non-NASA entity (i.e., public or private).

2.1.1 Central Campus/Processing District

The Central Campus/Processing District contains many functions that are critical to KSC's mission, including dedicated payload processing facilities; labs for engineering, testing, and prototyping; and administrative centers, including KSC Headquarters. The construction of the Central Campus Headquarters Phase Two building would consolidate the functions of existing buildings currently located in this district, as well as the VAB District (where existing buildings would be demolished). Many historic facilities that have been integral to the country's space exploration program are found in this district, such as the Space Station Processing Facility, Engineering Development Lab, and the Banana River Bridge (Roy D. Bridges Bridge). Refer to **Section 3.4** for a detailed summary of historic resources in this district.

Table 2.1-1 provides the projects proposed for the Central Campus/Processing District; refer to **Appendix B** for the project descriptions. **Figure 2.1-1** provides the locations of the proposed projects. Proposed projects within the Central Campus/Processing District would:

- Replace approximately 364,001 gross square feet (GSF);
- Add approximately 18,991 linear feet (LF) and approximately 78,960 LF, respectively, in various infrastructure improvements;
- Add approximately 50 acres for a fire training area and green space;
- Remove approximately 1,038,086 GSF; and
- Divest approximately 67,225 GSF of excess buildings.

Table 2.1-1. Proposed Projects within the Central Campus/Processing District

ID	Project Name	Project Area/ Size		Action to be Taken	Term Phase
A	Construct Contemplative Green Spaces	10	Acres	New Construction	Short
B	Provide Electric Vehicle Charging Stations throughout the District	12,000	GSF	New Construction	Short
C	Implement Pedestrian Improvements	3,155	LF	New Construction	Short
D	Construct Orion Clamshell	55,000	GSF	New Construction	Short
E	Construct Applied Science and Technical Analysis Facility	109,001	GSF	New Construction	Short
F	Repair/Upgrade Sewage Conveyance System (12 miles)	63,360	LF	Renovation	Short
G	Communication Distribution and Switching Center and IT Network	34,890	GSF	Renovation	Short/Mid
H	Implement Stormwater Improvements	Center-wide		Renovation	Short/Mid
I	Replace Child Development Center	22,225	GSF	Divestment/Outgrant	Mid
J	Outgrant/Divest Space Station Processing Facility Space	45,000	GSF	Divestment/Outgrant	Mid
K	Upgrade Orsino Substation	15,000	GSF	Renovation	Mid
L	Modernize and Upgrade Physical Security	25,000	GSF	Renovation	Mid

Table 2.1-1. Proposed Projects within the Central Campus/Processing District					
ID	**Project Name**	**Project Area/ Size**		**Action to be Taken**	**Term Phase**
M	Extend Chilled Water Loop	4,444	LF	New Construction	Mid
N	Construct Emergency Support Facility	30,000	GSF	New Construction	Mid
O	Replace Roy D. Bridges Bridge	15,600	LF	Demolition/Replacement	Mid
P	Demolish Facilities Programmed for Central Campus Headquarters Phase 2 (additional demo. in Vehicle Assembly Building District)	332,009	GSF	Demolition	Long
Q	Construct Central Campus Headquarters Phase 2	147,000	GSF	New Construction	Long
R	Demolish Facilities Programmed for Centralized Warehouse Facility (additional demo. in Vehicle Assembly Building District)	519,225	GSF	Demolition	Long
S	Demolish Facilities Programmed for Centralized Maintenance Complex (additional demo. in Vehicle Assembly Building District)	186,852	GSF	Demolition	Long
T	Construct New Communication Distribution and Switching Center	10,000	GSF	New Construction	Long
U	Repurpose Operations and Checkout South Wing Labs	43,327	GSF	Renovation	Long
V	Extend 3rd Street Southeast	5,892	LF	New Construction	Long
W	Redevelop Fire Training Area	40	Acres	New Construction	Capacity*
X	Implement Banana River Drive Sea-Level Rise Stabilization	5,500	LF	New Construction	Capacity*

Note: *Capacity projects are intended to enhance or expand beyond the current capabilities but with currently undefined phasing or funding sources

Legend: GSF = gross square feet; LF = linear feet.

2.1.2 Exploration Launch District

The Exploration Launch District comprises two of KSC's primary launch pads, which are some of the most critical pieces of infrastructure, crucial to NASA's mission. Two additional launch pads within the district (LC-48) support the emerging small-class launch vehicle market and USSF. Historic facilities found in this district include the Crawlerway, LC-39 Pad A Historic District, and LC-39 Pad B Historic District. Refer to **Section 3.4** for a detailed summary of historic resources in this district.

Table 2.1-2 provides the projects proposed for the Exploration Launch District; refer to **Appendix B** for the project descriptions. **Figure 2.1-2** provides the locations of the proposed projects; no demolition projects are proposed within this district.

Full implementation of the proposed projects within the Exploration Launch District would:

- Replace approximately 155 acres; and
- Add approximately 68,720 LF in infrastructure improvements.

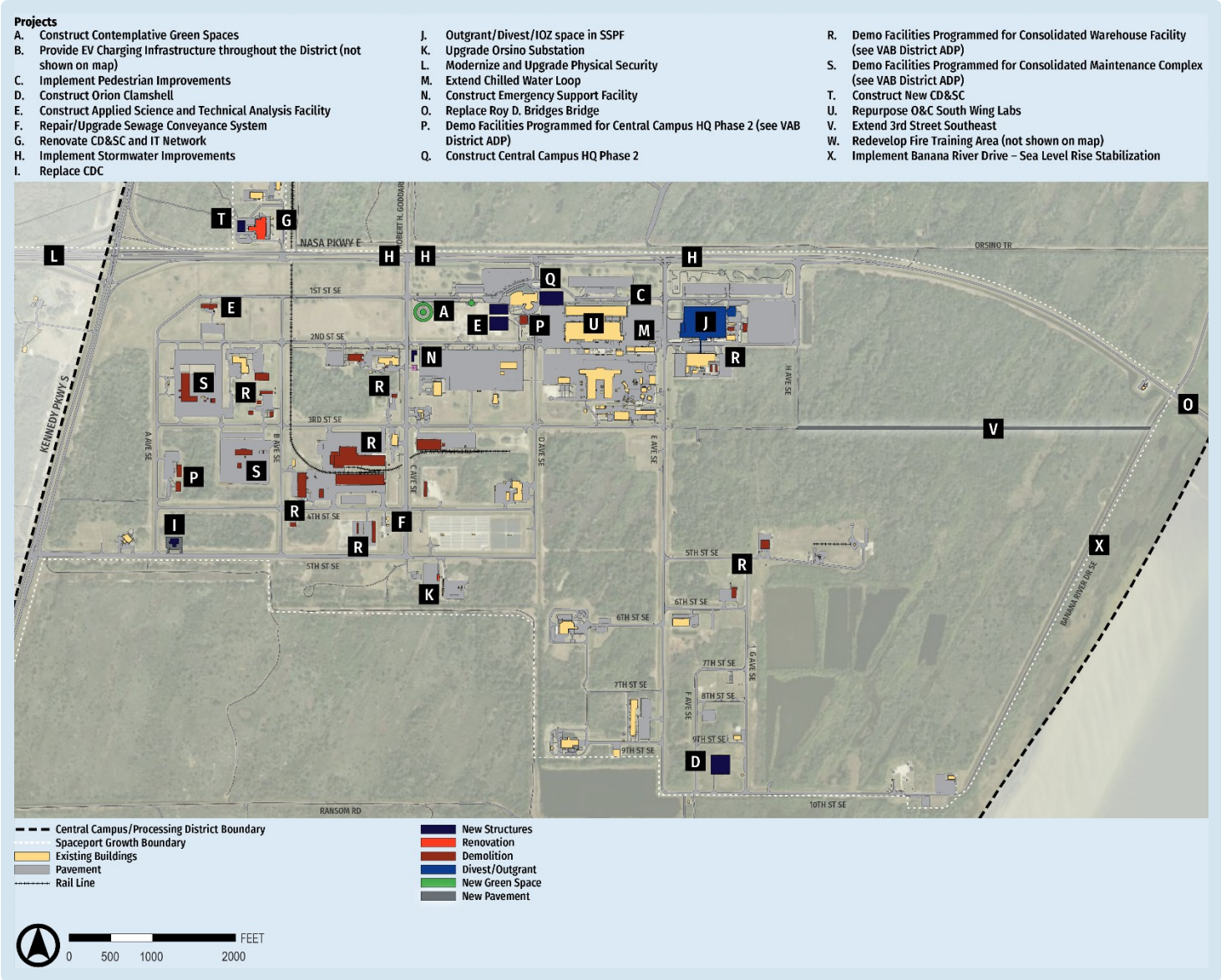


Figure 2.1-1. Projects Proposed within the Central Campus/Processing District

Table 2.1-2. Proposed Projects within the Exploration Launch District

ID	Project Name	Project Area Size		Action to be Taken	Term Phase
A	Conduct Dune/Beach Restoration	30,300	LF	New Construction	Short
B	Implement Scrub Habitat Mitigation Strategies	20	Acres	New Construction	Short
C	Replace LC-39 Area Duct Bank	13,500	LF	Renovation	Short
D	Construct Liquefied Natural Gas (LNG) Line to Phillips Parkway	14,300	LF	New Construction	Short
E	Upgrade Stormwater Treatment Infrastructure	25,925	LF	Renovation	Short
F	Enable/Construct second pad at LC-48	20	Acres	New Construction	Short
G	Improve Pad LC-39B Bypass Road to Serve as Improved Access to Phillips Parkway	4,520	LF	New Construction	Mid
H	Improve Phillips Parkway Roadway	25,925	LF	Renovation	Mid
I	Add/Repair High-Pressure Gas Batteries	4,000	SF	Renovation	Mid
J	Elevate/Improve Phillips Parkway	25,925	LF	Renovation	Long
K	Improve Titusville Beach Road Access (two-way, paved)	9,800	LF	New Construction	Long
L	Create Titusville Beach Road Utility Corridor	9,800	LF	New Construction	Long
M	Construct Substation	5	Acres	New Construction	Long
N	Construct LC-49 Future Medium/Heavy Launch Capacity	80	Acres	New Construction	Capacity
O	Construct Future Small-Class Vehicle Landing Site	10	Acres	New Construction	Capacity
P	Construct Future Landing Site	15	Acres	New Construction	Capacity

Legend: LC = Launch Complex; LF = linear feet; SF = square feet.

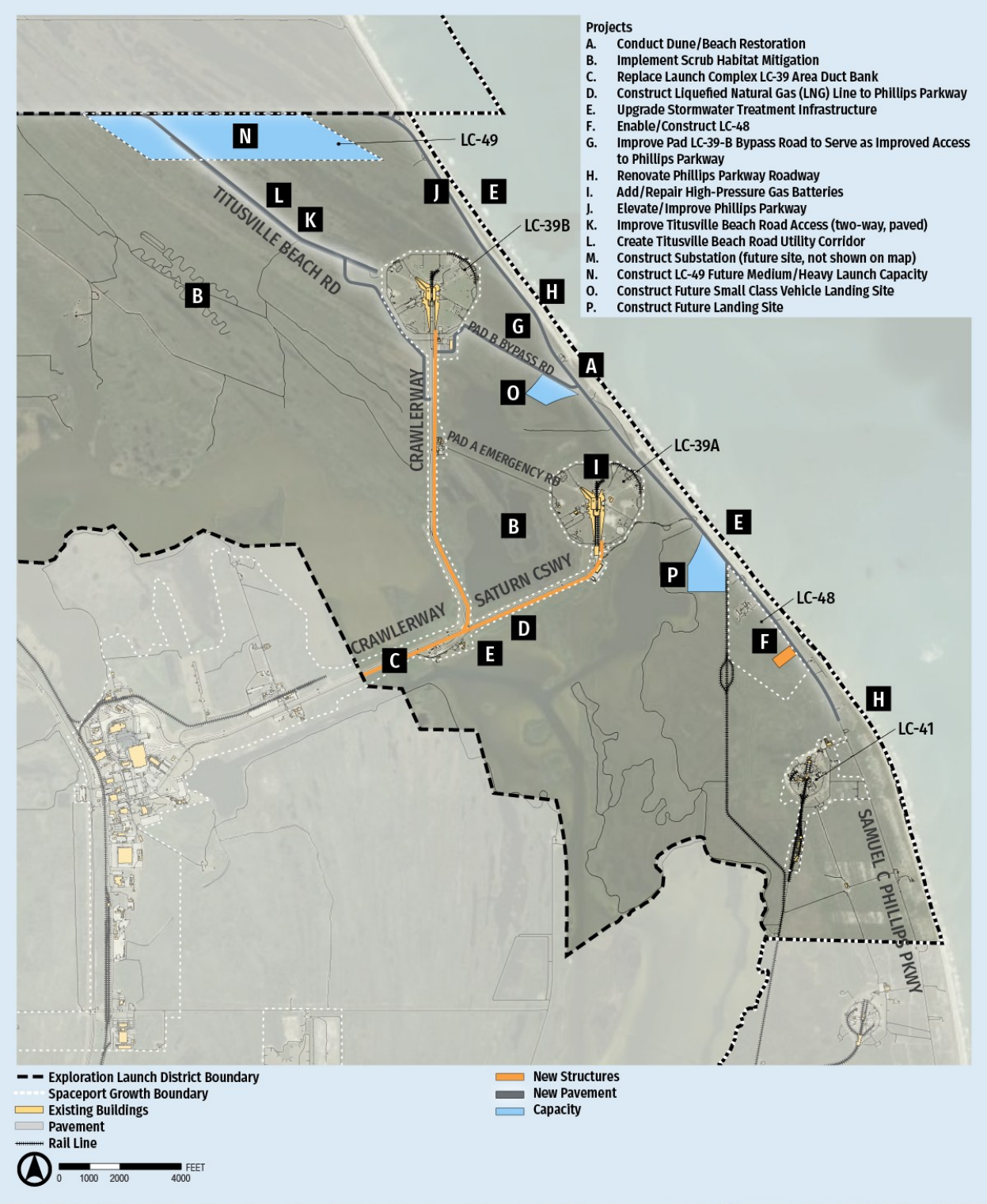


Figure 2.1-2. Projects Proposed within the Exploration Launch District

2.1.3 Vehicle Assembly Building District

The VAB District includes assets that are critical to KSC's mission, such as cleanrooms and processing facilities, the Launch Control Center, and the district's namesake iconic building. The construction of a centralized warehouse building and maintenance complex includes the consolidation of existing buildings currently located in this district and the Central Campus/Processing District that are proposed to be demolished. Several historic facilities that have been integral to the country's space exploration program are located in this district, including the VAB itself and its Utility Annex, the Orbiter Processing Historic District, the Thermal Protection System Facility, and the KSC Railroad System Historic District. It should be noted that the launch countdown clock, which was previously located outside of the Press Site in this district, has been moved to the Visitor Complex in the Space Commerce District. Refer to **Section 3.4** for a detailed summary of historic resources in this district.

Table 2.1-3 provides the projects proposed for the VAB District. Refer to **Appendix B** for the project descriptions. **Figure 2.1-3** provides the locations of the proposed projects. As illustrated in **Figure 2.1-3**, numerous buildings would be demolished. The activities and operations within the numerous buildings slated for demolition would be consolidated and moved to the Central Campus/Processing District under Projects P, R, and S (refer to **Section 2.1.1, Central Campus/Processing District**).

Proposed projects within the VAB District would:

- Replace approximately 312,420 GSF;
- Add approximately 35,300 LF in infrastructure improvements;
- Add approximately 53 acres in facilities and other improvements; and
- Remove approximately 872,031 GSF.

Table 2.1-3. Proposed Projects within the Vehicle Assembly Building District

ID	Project Name	Project Area Size		Action to be Taken	Term Phase
A	Construct Liquid Oxygen (LO_2)/Liquid Nitrogen (LN_2) Plant	420	GSF	New Construction	Short
B	Upgrade Converter Compressor Facility (CCF)	4,668	GSF	Renovation	Short
C	Construct Payload Processing Facility	20	Acres	New Construction	Short
D	Upgrade Saturn Causeway Utilities	10,300	LF	New Construction	Short
E	Add C-5 Substation Capacity	1	Acres	New Construction	Short
F	Modify/Stabilize Roadways to Mitigate Climate Change Impacts	10,000	LF	Renovation	Short, Mid
G	Construct Supplemental Gaseous Nitrogen (GN_2) Pumping System	12,000	GSF	New Construction	Short
H	Construct New Press Site (Communications, Press, Public Affairs Facility)	25,000	GSF	New Construction	Short
I	Renovate Launch Support Equipment	2,000,000	GSF	Renovation	Mid
J	Mitigate Climate Change – Critical Facility Flood Fortification	106,720	GSF	Renovation	Mid
K	Construct Centralized Warehouse	200,000	GSF	New Construction	Long
L	Construct Centralized Maintenance Complex	75,000	GSF	New Construction	Long
M	Upgrade/Expand State Road 3 Payload Transportation	25,000	LF	New Construction	Long
N	Outgrant/Demo. Operations Support Building (OSB) 1	58,000	GSF	Demolition	Long
O	Construct Advanced Exploration Processing Facility	5	Acres	New Construction	Capacity
P	Expand Wharf Support Facilities/Turn Basin	2	Acres	New Construction	Capacity
Q	Connect Banana Creek and Indian River Lagoon	25	Acres	New Construction	Capacity
*	Demolition of three buildings for Central Campus Headquarters (Project P in Central Campus/Processing District)	23,883	GSF	Demolition	Long

Table 2.1-3. Proposed Projects within the Vehicle Assembly Building District					
ID	**Project Name**	**Project Area Size**		**Action to be Taken**	**Term Phase**
*	Demolition of 53 buildings for Centralized Warehouse (Project R in Central Campus/Processing District, Project K in VAB District)	545,521	GSF	Demolition	Long
*	Demolition of 24 buildings Centralized Maintenance Complex (Project S in Central Campus/Processing District, Project L in VAB District)	244,627	GSF	Demolition	Long

Legend: GSF = gross square feet; LF = linear feet.
* See Section 2.1.1, Central Campus/Processing District.

2.1.4 Parcel Opportunity Analysis (POA)

The POA builds off "capacity projects" identified in the ADPs that are most suitable to accommodate future development. The POA includes more specific details on potential future site layouts, infrastructure requirements, and other development considerations that should be taken into account to enable future development on high-demand parcels. The POA identified five land parcels, designated as Parcels 1 through 5. Parcels 2 and 5 were captured in the ADPs as Projects A, E, H, N, and W in the Central Campus/Processing District. Parcels 1, 3, and 4 are analyzed in this PEA and are described below. **Figure 2.1-4** provides the parcel locations; refer to **Appendix B** for the project descriptions.

- Parcel 1 includes 15 acres that could be made available for development after construction of its Mobile Launcher 2 (ML-2) is completed. Permitted uses include light industrial, administrative, and open space. This site could be made available for a future commercial partner who would have efficient access to infrastructure hookups.
- Parcel 3 includes a maximum developable area of 84.6 acres that could accommodate light industrial, heavy industrial, and/or hazardous operations. Activities in this parcel could result in potential wetland effects, scrub-jay effects, and other development constraints. Parcel 3 includes three sub-parcels as options for future development.
- Parcel 4 includes approximately 35 acres that could be utilized for laydown yard space and/or temporary forms of hazardous testing.

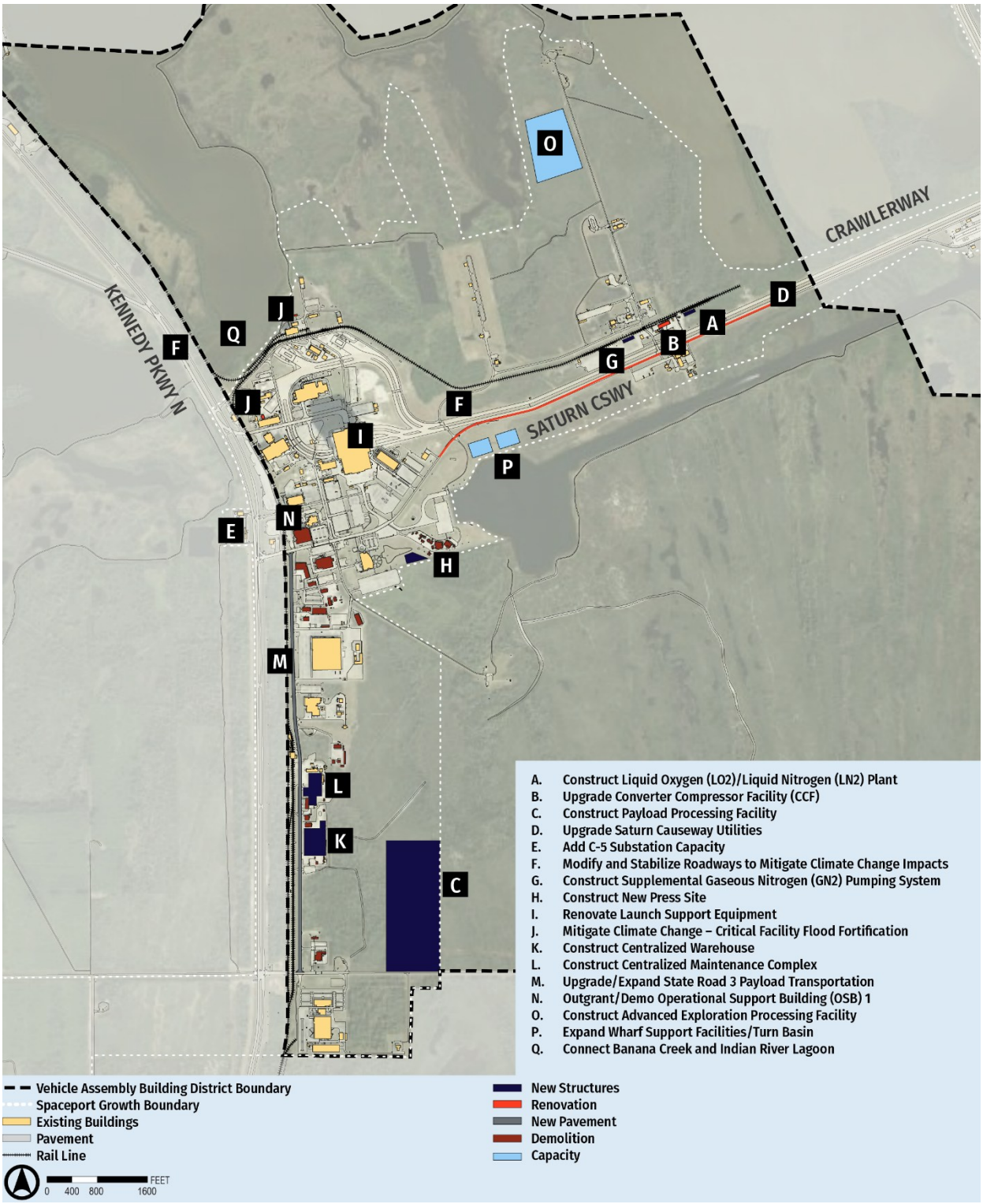


Figure 2.1-3. Projects Proposed within the Vehicle Assembly Building District

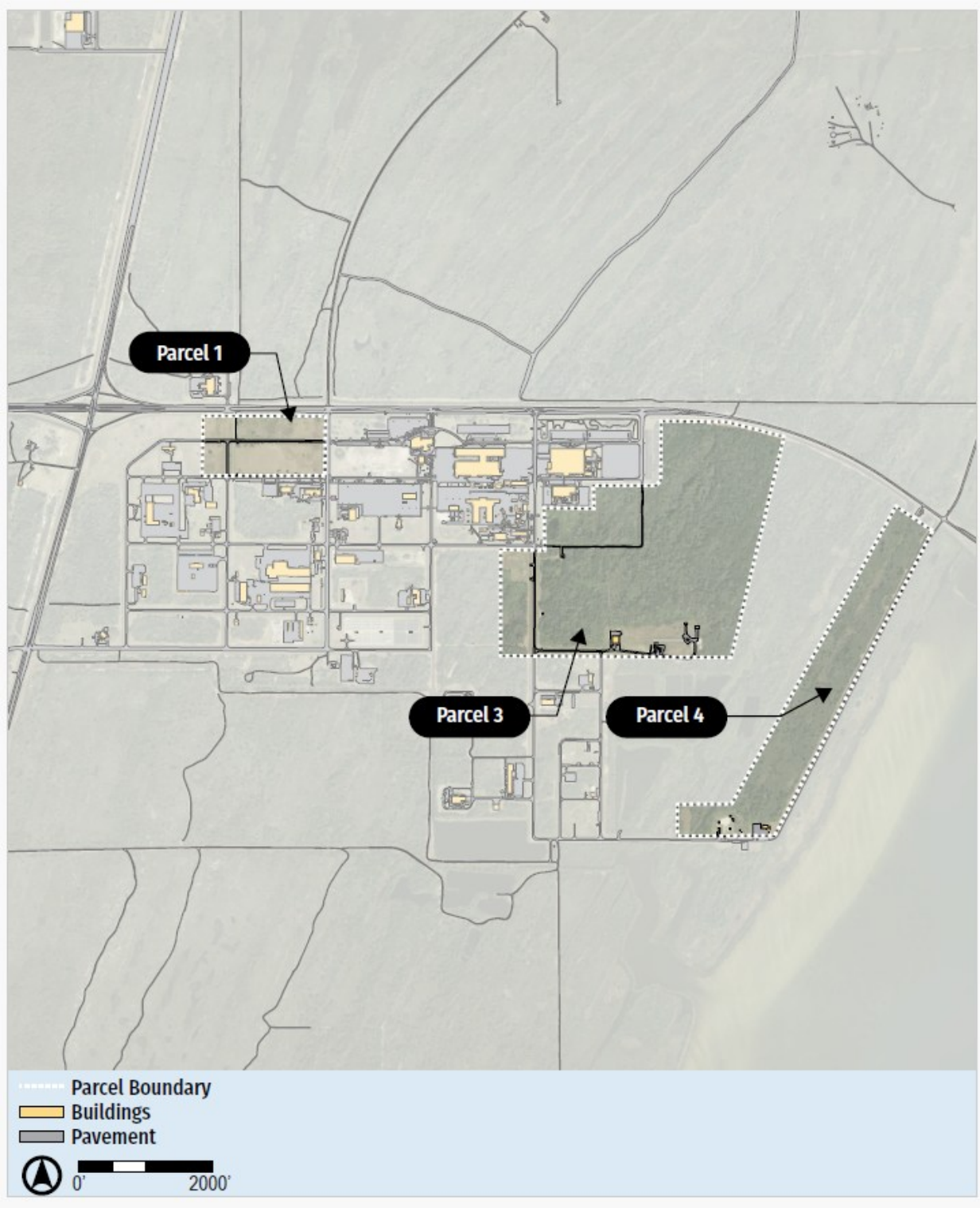


Figure 2.1-4. Areas of Potential Future Site Development from the Parcel Opportunity Analysis

2.1.5 Center Development Plan (CDP)

The 2024 CDP focuses on strategies that KSC should implement to support evolving NASA and commercial requirements. The projects identified in the CDP are accounted for in the ADPs but are intended to link activities that span multiple districts on a larger scale. One of the key strategies addressed in the CDP is the need for updated electrical transmission capabilities. While the ADP identifies the need for a future substation near LC-39A to provide additional electrical loads to support increased launch tempos, a larger-scale project would involve upgrading the existing Florida Power and Light transmission system from 115 kilovolts (kV) to 230 kV that would require a new 100-foot-wide transmission line connecting the mainland to KSC and to CCSFS. **Figure 2.1-5** provides the location of the proposed transmission line; refer to **Appendix B** for a detailed project description.

2.2 ALTERNATIVES CARRIED FORWARD FOR ANALYSIS

In developing a reasonable range of alternatives to the Proposed Action that are technically and economically feasible, and meet the purpose and need of the proposal, KSC identified one Action Alternative for analysis in this PEA (Proposed Action), along with the No Action Alternative. The process for developing a reasonable range of alternatives included conducting interviews from October 2022 to March 2023 with leadership, facility managers, and a variety of other subject matter experts from 17 directorates at KSC. From November 2022 to June 2023, three workshops were conducted that allowed KSC stakeholders to collaboratively generate planning solutions to the current and future problems facing KSC. Stakeholders considered the 2020 KSC Vision Plan and other NASA planning documents during scenario planning exercises and when evaluating the proposed plan. Three 2024 ADPs document the stakeholder-driven planning processes and resulting recommendations. In addition, the 2024 POA identifies future site layouts for high-demand parcels identified in the ADPs, while the 2024 CDP focuses on strategies supporting evolving NASA and commercial requirements (see **Section 1.3.2** for descriptions of the ADP, POA, and CDP).

2.2.1 Proposed Action

KSC proposes to implement the Central Campus/Processing District, Exploration Launch District, and VAB District ADPs, along with projects in the POA and CDP, as described and presented in **Section 2.1, Proposed Action**. **Appendix B** provides information about projects proposed within each district.

The Proposed Action would add approximately 676,421 GSF of new construction in the Central Campus/Processing and VAB Districts; however, demolition of obsolete buildings and structures from the two districts would remove approximately 1,910,117 GSF resulting in an overall reduction of 1,233,696 GSF at KSC. Divestment of excess buildings in the Central Campus/Processing District would remove approximately 67,225 GSF from KSC's real property inventory. Infrastructure improvements throughout the three districts would add a total of 123,011 LF; stormwater improvements would be implemented Center-wide. Approximately 253 acres of land within the growth boundaries of the three districts would be developed for various projects.

2.2.2 No Action Alternative

Under the No Action Alternative, KSC would not implement a phased approach to facility construction, demolition, and renovation; infrastructure upgrades; and divestments/outgrants at KSC. This would remove guidelines for real property decision-making and hinder implementation of the KSC Master Plan 2012-2032. KSC would continue to operate the buildings and infrastructure currently in use within

Figure 2.1-5. Proposed Transmission Line from the Center Development Plan

the Central Campus/Processing District, Exploration Launch District, and VAB District. The No Action Alternative would not meet the purpose and need for the Proposed Action; however, the No Action Alternative is carried forward for analysis in this PEA. The No Action Alternative will be used to analyze the consequences of not undertaking the Proposed Action and will serve to establish a comparative baseline.

2.3 ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD FOR ANALYSIS

During the 2022 to 2024 process for developing a reasonable range of alternatives input to the three ADP documents and subsequent recommendations from the workshop events resulted in three alternative plans. The alternative plans were further refined and resulted in a preferred ADP for each of the planning districts (Central Campus/Processing District, Exploration Launch District, and VAB District). By developing and evaluating alternative plans for each planning district during the ADP process, KSC determined that those alternative plans would not meet the purpose of the Proposed Action with respect to each of the identified planning districts. As a result, those alternative plans are not carried forward for detailed analysis in this PEA.

2.4 SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Programmatic NEPA documents are broad in scope. This PEA addresses the most reasonably foreseeable actions in the three planning districts at KSC within a 20-year planning horizon. Prior to implementation, each proposed project would be subject to review through the KSC Environmental Checklist. This process is conducted to: 1) identify whether the project is sufficiently analyzed within the KSC CMP PEA or additional environmental analysis and/or NEPA documentation (i.e., categorical exclusion, EA, or Environmental Impact Statement) is needed, and 2) identify any environmental permits, mitigation, or other requirements that may be required for the project. This may include compliance with the Endangered Species Act (ESA) Section 7, the National Historic Preservation Act (NHPA) Section 106, the Clean Water Act of 1972 (CWA), the Clean Air Act (CAA), the Resource Conservation and Recovery Act (RCRA), and other various state laws and regulations depending on the project. This review results in a Record of Consideration (REC), which provides a Class of Action Determination and a list of environmental requirements to assure compliance with applicable environmental laws and regulations.

The Executive Summary provides a summary of the potential effects to each resource area analyzed in this PEA. Based on the analysis presented, no significant environmental effects would result from implementation of the Proposed Action or the No Action Alternative.

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3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the environmental resources and baseline conditions at KSC that could potentially be affected from implementing the Proposed Action and analyzes the potential direct and indirect effects.

Changes to the natural and human environment that could result from the Proposed Action are evaluated relative to the existing environmental conditions. The following five levels of potential effects were identified:

- None – No effect.
- Negligible – The effect is barely perceptible or measurable, remains confined to a single location, and would not result in a sustained recovery time for the resource affected.
- Minor – The effect is readily perceptible and measurable; however, the effect may be temporary, and the resource should recover in a relatively short period.
- Moderate – The effect is perceptible and measurable and may not remain localized, affecting areas adjacent to the Proposed Action area; adverse effects to a resource may require several years to recover.
- Major – An effect is predicted that meets the intensity/context significance criteria for the specified resource.

The potential effects to the following resource areas from implementation of the CMP would be negligible or non-existent (as such, they were not analyzed in this PEA):

Geological Resources: The Proposed Action is not expected to significantly alter topography, geology, or soils within the Central Campus/Processing, Exploration Launch, and VAB Districts. Construction and demolition activities would require localized earthwork, including land clearing, excavation, fill, transport, and compaction. These effects, although long-term, would be minor, would have no large-scale effect on topography, and are not expected to alter geological resources at KSC. Best Management Practices (BMPs), including construction-specific stormwater management practices and re-vegetation of disturbed areas, would be implemented to reduce soil erosion; therefore, the Proposed Action would have negligible effect on geological resources.

Noise. The Proposed Action would generate short-term temporary noise from site preparation, demolition, and construction activities, which would be present at different construction locations in the three districts at varied periods throughout the 20-year planning horizon. Construction activities would typically be limited to daytime hours. Construction noise could produce maximum sound levels of approximately 70 to 95 decibels at 50 feet away from construction equipment, which would dissipate to around 65 decibels at 300 feet and less than 65 decibels at 1,000 feet; 65 decibels is typical of noisy urban residential areas (USEPA, 1974). Sensitive receptors, such as schools, residences, hospitals, and libraries, are 5.5 miles from proposed development activities at KSC and would not be affected by the noise. After construction, noise levels would return to conditions characteristic of the current noise environment. Therefore, implementation of the Proposed Action would result in negligible noise effects.

Public Health and Safety: Activities associated with the Proposed Action would include renovation, demolition, and construction projects occurring within the Central Campus/Processing, Exploration Launch, and VAB Districts located at KSC. Negligible effects to public health and safety are anticipated through these actions, as KSC would close off certain sections to the public with appropriate signage to alert the public. Therefore, the public is not expected to be in areas of construction, renovation, or demolition, and activities would be conducted by qualified personnel following federal and state

regulations, standard operating procedures, and BMPs. As a result, implementation of the Proposed Action would result in negligible effects to public health and safety.

Socioeconomics: Implementing the Proposed Action at KSC would have no effect on the local population, employment opportunities, housing, or schools. Over the duration of this project (20 years), various short-, mid-, and long-term renovation, demolition, and construction projects could potentially produce temporary economic benefits to the region surrounding KSC. Transitioning KSC to a multi-user spaceport has the potential to produce significant, long-term economic benefits to the region surrounding KSC, however these benefits are not fully known in the present day. Given the programmatic nature of this EA, specific details of the proposed projects are not currently available to develop a quantified socioeconomic analysis. Once these details are known, a re-evaluation of potential socioeconomic effects would be completed using the KSC Environmental Checklist (KSC Form 21-608V2 NS). Implementation of the Proposed Action would result in negligible temporary effects and beneficial long-term effects.

Transportation: An efficient transportation network at KSC is critical to providing access to over 11,000 workers while also enabling payload transport to support launch activities (NASA KSC, 2020a). According to the NPR 8705, *Risk Classification for NASA Payloads*, the term payload is defined as "any airborne or space equipment or material that is not an integral part of the carrier vehicle (i.e., not part of the carrier aircraft, balloon, sounding rocket, expendable or recoverable launch vehicle) …and which NASA has design, development, test, or operations responsibility" (NASA, 2004). Payload transportation on KSC roads requires special provisions and approvals in accordance with the NASA Transportation and General Traffic Management Directive, NPR 6200.1D (NASA, 2014).

Primary roadways that provide access to and from KSC include Kennedy Parkway North and South (State Route 3), NASA Parkway East, and Phillips Parkway. NASA Parkway East is the main access road for tourists, personnel, and cargo deliveries. The following projects under the Proposed Action affect primary roadways:

- Kennedy Parkway North, or State Road 3 (Project M, VAB District), is located along the western boundary of the Project Area. This project includes roadway widening and the expansion of the parallel Contractors Road to prevent bottlenecks between the VAB District and the Central Campus/Processing District during payload transports. The simultaneous expansion of Contractors Road would provide an alternate route for privately-owned vehicles or smaller payloads to reduce congestion. This is considered a long-term project (11-20 years).
- The Roy D. Bridges bridge (Project O, Central Campus/Processing District) is part of NASA Parkway East. The bridge is proposed to be demolished and replaced with a new bridge capable of supporting larger payloads. This is considered a mid-term phasing project (6-10 years).
- Phillips Parkway (Projects H and J) within the Exploration Launch District is proposed to be modified with right-of-way widening and building pull-offs as part of a mid-term project (6-10 years) and later elevated to mitigate flooding and sea-level rise as a long-term project (11-20 years).

Other transportation projects considered under the Proposed Action include the extension, improvement, stabilization, and elevation of secondary roads within KSC grounds. Additionally, proposed non-transportation projects that involve new construction or demolition of buildings, utility upgrades, or infrastructure improvements have the potential to affect traffic during construction. Trucks and privately

owned vehicle use by commuting project workers would temporarily increase traffic during construction. Transportation projects under the Proposed Action are mid- to long-term projects that would be phased over a period of 15 years; therefore, the effects of added construction traffic would likely be spread out over time and would have a negligible effect on traffic flow in the context of total traffic volume traveling to/from KSC.

Temporary lane closures may be warranted during construction activities that involve roadwork inside and outside KSC. Appropriate signage and detours would be provided to maintain traffic flow. KSC would coordinate with other responsible agencies, such as the FDOT, regarding the use of public roads during project construction to minimize any traffic disruption. These effects would be negligible and temporary, occurring only for the duration of the construction period. Therefore, construction-related effects to traffic as a result of the Proposed Action are anticipated to be negligible.

Post-construction, the road-widening projects, Contractors Road expansion project, Pad 39B Bypass Road improvements, and the Roy D. Bridges bridge replacement project would increase the efficiency of, and support for, payload transports. Capacity projects, such as the construction of new launch pads or landing sites, could increase activity at KSC and have the potential to increase traffic in the long term. However, KSC would follow existing guidelines to minimize traffic disruption. In the Exploration Launch District, the proposed construction of LC-49 (Project N), which is located on either side of Titusville Beach Road, would come after the proposed improvements to Titusville Beach Road (Projects L and K). Other capacity projects are likely to have no effect on traffic inside or outside of KSC based on location and/or project type. Therefore, it is expected that potential traffic effects associated with capacity projects would be negligible.

Overall, the transportation projects would result in a reduced potential for congestion and bottlenecks and would generate beneficial long-term traffic effects both inside and outside of KSC. Therefore, implementation of the Proposed Action would have negligible temporary effects and long-term beneficial effects on transportation at KSC.

Reasonably foreseeable environmental effects result when the effects of an action are added to or interact with other effects in a particular place and within a particular time. Specific projects that are currently being implemented or have enough detail to be considered reasonably foreseeable include:

- Final EA and FONSI for the Replacement of the Administrative Building Complex and Construction of the Next Big Thing Experience at KSC (JonesEdmunds, 2024)
- Final Supplemental EA (SEA) and FONSI for the Roberts Road SpaceX Operations Area Expansion and Supporting Infrastructure on KSC (SpaceX, 2024)
- EA for the Construction of a New Retail Warehouse at KSC (Ivey's Construction, 2023)
- EA for Exploration Park North at KSC (JonesEdmunds, 2021)
- EA for the Schwartz Road Property at KSC (NASA KSC, 2025a)
- KSC REC 12714 for Blue Origin Manufacturing Complex Site Improvements (NASA KSC, 2024f)
    - Associated with an EIS for the International Space Research Park at the KSC, Florida, dated June 2004 (Record of Decision signed November 23, 2004)
- KSC REC 12670 for Airbus US Space and Defense site development and building expansion (NASA KSC, 2024e)
    - Associated with an EA for Exploration Park-Phase 1 (FONSI signed December 2004)
- KSC REC 12535 for the development of a railhead on KSC property (NASA KSC, 2023)

  - For exploration activities only (an EA would be prepared if the proposed project moves forward)
- SpaceX Starship-Super Heavy Launch Vehicle at LC 39A (NASA KSC, 2019)
- SpaceX Falcon 9 Program at LC-39A on KSC (NASA KSC, 2025c)

Once specific details of each proposed project are known, a re-evaluation of potential site-specific effects on the following resources would be completed using the KSC Environmental Checklist and additional analysis would be conducted as warranted.

3.1 AIR QUALITY

3.1.1 Definition of the Resource

In accordance with Federal CAA requirements, the air quality in a given region or area is measured by the concentration of criteria pollutants in the atmosphere. A region's air quality is influenced by many factors, including the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions. Most air pollutants originate from human-made sources, including mobile sources (e.g., cars, trucks, buses) and stationary sources (e.g., factories, refineries, power plants), as well as indoor sources (e.g., some building materials and cleaning solvents).

3.1.1.1 Air Quality Regulatory Requirements

Under the CAA, the U.S. Environmental Protection Agency (USEPA) developed the National Ambient Air Quality Standards (NAAQS) for pollutants that have been determined to affect human health and the environment. The NAAQS represent the maximum allowable concentrations for the following designated criteria pollutants: carbon monoxide (CO); nitrogen dioxide (NO_2); ozone (O_3); lead (Pb); particulate matter equal to or less than 2.5 microns in diameter ($PM_{2.5}$); particulate matter equal to or less than 10 microns in diameter (PM_{10}); and sulfur dioxide (SO_2) (40 CFR Part 50).

The CAA also gives the authority to states to establish air quality rules and regulations. While each state has the authority to adopt standards stricter than those established under the federal program, the State of Florida accepts the federal standards. The USEPA classifies the air quality in an Air Quality Control Region (AQCR), or in subareas of an AQCR, according to whether the concentrations of criteria pollutants in ambient air exceed the NAAQS. Areas where ambient air pollutant concentrations are below the NAAQS are designated as "attainment," while areas where ambient air concentrations are above the NAAQS are designated as "nonattainment." Areas previously designated as nonattainment that have subsequently demonstrated compliance with the NAAQS are designated as "maintenance" for a period of time (normally 20 years after the effective date of attainment); this time period assumes that the area remains in compliance with the standard. Areas that lack sufficient data to determine their designation are designated "unclassifiable," and are treated as attainment areas for the purpose of stationary source air permitting.

In accordance with the CAA, each state must develop a State Implementation Plan, which is a compilation of regulations, strategies, schedules, and enforcement actions designed to achieve compliance or keep the state in compliance with all NAAQS.

State-level construction permits may also be required which can impose emission limits, work practice controls, emissions monitoring, and recordkeeping and reporting requirements. These rules would include, but are not limited to, Florida Administrative Code (FAC) Chapter 62-210 Stationary Sources General Requirements (FDEP, 2023), Chapter 62-296 Stationary Sources – Emission Standards (FDEP, 2022), and Chapter 62-297 Stationary Sources – Emissions Monitoring (FDEP, 2015).

3.1.2 Existing Conditions

Ambient air quality at KSC is influenced by NASA operations, land management practices, vehicle traffic, and emission sources outside of KSC. Controlled burns for vegetation fuel load reduction, as well as space launches, influence air quality as episodic events. One of the most influential air quality fluctuations on a routine basis is created by the emissions from automobiles entering and departing KSC each day, which includes over 11,000 employees, along with tourists, constructions workers and deliveries (NASA KSC, 2020c).

KSC is located in Brevard County, which is part of the Central Florida Intrastate AQCR (40 CFR 81.95), is classified as an attainment area for all NAAQS (USEPA, 2024b) and serves as the Region of Influence (ROI) for this analysis. Operations at KSC include stationary point sources of air emissions such as hot water generators/boilers and gas dispensing operations (FDEP, 2021). KSC operations also include mobile sources, which can include support equipment, motor vehicles, and rocket launch vehicles.

A design value is a statistic that describes the air quality status of a given location relative to the level of the NAAQS. Design values are computed and published annually by USEPA's Office of Air Quality Planning and Standards and reviewed in conjunction with the USEPA Regional Offices (USEPA, 2024a). **Figure 3.1-1** compares the 2023 Brevard County Design Values to the NAAQS. The figure indicates that the Brevard County maximum design values for CO, NO_2, SO_2, and 24-hour $PM_{2.5}$ are all below 50 percent of the NAAQS. The design values for O_3 and annual $PM_{2.5}$ are above 50 percent but do not reach or exceed their respective NAAQS.

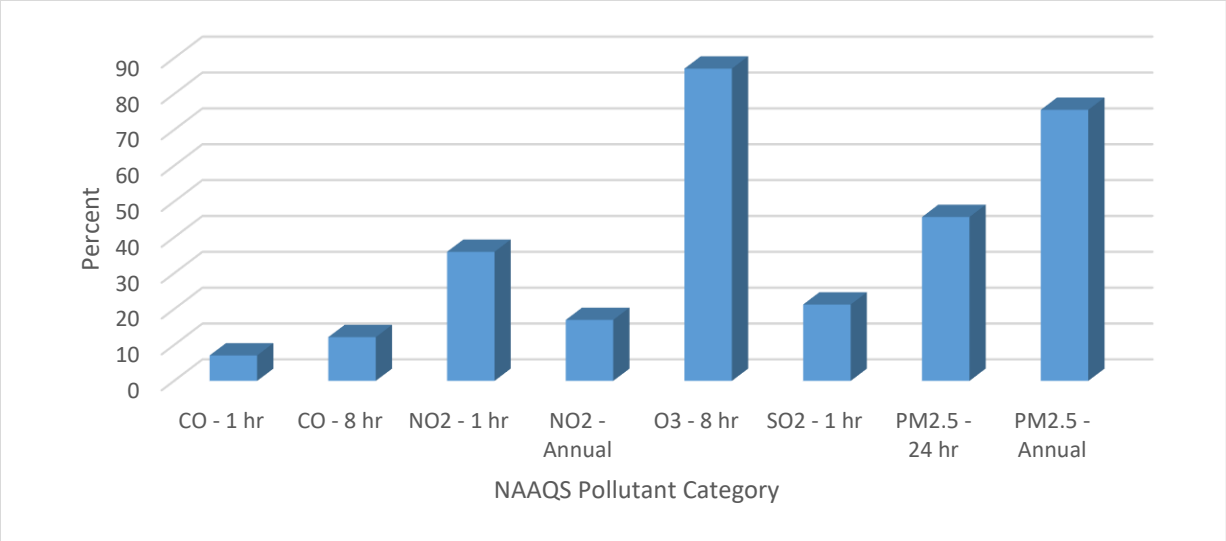

Figure 3.1-1 Comparison of 2023 Brevard County Design Values with NAAQS

Source: USEPA 2024a.
Note: On February 7, 2024, USEPA strengthened the NAAQS for $PM_{2.5}$. Specifically, the USEPA is setting the level of the primary annual $PM_{2.5}$ standard at 9.0 µg/m^3 to provide increased public health protection, consistent with the available health science.
Legend: µg/m^3 =microgram per cubic meter; CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards; NO_2 = nitrogen dioxide; $PM_{2.5}$ = particulate matter equal to or less than 2.5 microns in diameter; SO_2 = sulfur dioxide, ppm = parts per million; ppb = parts per billion; USEPA = United States Environmental Protection Agency.

3.1.3 Environmental Consequences

3.1.3.1 Proposed Action

Construction Effects

Under the Proposed Action, construction activity would occur over the 20-year planning period. The Proposed Action identifies specific projects which are identified for short-term (0-5 years), mid-term (6-10 years), and long-term (11-20 years). For the purpose of estimating annual emissions associated with construction activity, this analysis calculated the emissions from the short-term projects for the Central Campus/Processing District, Exploration Launch District, and VAB District (Project Area). Development would predominantly include pavements, buildings, and installation of utilities. Furthermore, emissions include estimated haul truck activity, as well as construction worker trips to and from KSC. Once designed, any proposed projects would require future NEPA analysis to assess effects.

Table 3.1-1 presents the estimated annual emission totals for all criteria pollutants in tons. The results are compared to a 100 tons per year (tpy) comparative indicator threshold, which is the Title V permit threshold for criteria pollutants in attainment areas.

Table 3.1-1. Annual Emissions from Short-Term (0-5 Years) Construction Projects						
	VOCs (Tons)	**CO** (Tons)	**NOx** (Tons)	**SO_2** (Tons)	**PM_{10}** (Tons)	**$PM_{2.5}$** (Tons)
Central Campus District	0.12	0.61	2.62	0.00	4.05	0.50
Exploration Launch District	0.37	1.94	8.36	0.01	109.93	11.31
Vehicle Assembly Building District	1.04	5.39	24.02	0.01	4.22	1.30
Total	**1.52**	**7.93**	**35.00**	**0.02**	**118.20**	**13.11**
Comparative Indicator Threshold	100	100	100	100	100	100
Exceed Threshold?	No	No	No	No	Yes	No

Legend: CO = carbon monoxide; NO_x= nitrogen oxides; PM_{10} = particulate matter equal to or less than 10 microns in diameter; $PM_{2.5}$ = particulate matter equal to or less than 2.5 microns in diameter; SO_2 = sulfur dioxide; VOCs = volatile organic compounds.

As shown in **Table 3.1-1**, the annual short-term construction project emissions for volatile organic compounds (VOCs), CO, NO_x, SO_2, and $PM_{2.5}$ would all be below the comparative indicator threshold of 100 tpy for all criteria pollutants. PM_{10} emissions would be above the 100 tpy comparative indicator threshold and is due to the fugitive dust emissions associated with the various construction projects. The fugitive dust emissions would primarily occur during the grading phase of the short-term construction projects and can be attributed to the large footprint of the various projects within each planning district. Therefore, the amount of grading activity would cause fugitive dust emissions to be above the 100 tpy comparative threshold and mitigation would be required to ensure emissions are reduced to a reasonable level.

To mitigate particulate matter emissions to a reasonable level, periodic water spraying would be performed based on weather conditions (wind, humidity, etc.). In addition, material storage piles would be covered and stabilized or enclosed if they are not frequently accessed. Vehicle speeds on unpaved haul and service roads would be limited to 15 miles per hour. Paved roads would be washed, swept, or vacuumed at a frequency necessary to eliminate material that is visible within the streets surrounding the source of fugitive dust emissions. All trucks hauling dirt, sand, soil, or other loose materials would be tarped with a fabric cover.

Emissions from construction equipment operations could be mitigated with standard management practices that include limitations on idling and strict maintenance practices to ensure equipment is operating within recommended parameters. These mitigation measures and management practices help to reduce emissions and consequently would benefit local air quality effects. Based on these results and the fact that the ambient air criteria pollutant design values are well below the NAAQS thresholds for attainment, these emissions would not contribute significant effects to ambient air quality.

The same types of emissions and effects would occur for mid-term and long-term projects that are listed under the Proposed Action. Given the programmatic nature of this EA, specific details of the proposed projects are not currently available and additional NEPA environmental analysis would need to be conducted when these project plans are specified.

Operational Effects

Operational effects would largely increase as many of the projects over the 20-year horizon are based on development for increased capacity at KSC.

In the short term, project development would have minimal effects to air resources. The additional development of LC-48 would expand launch capacity and the effects of that are not currently known. Use of LC-48 would require its own NEPA analysis once the specific vehicles to be used and frequency of use are known.

Analysis of the increases in launch activities from unknown launch vehicles at LC-48 and LC-49, operation of a liquefied natural gas plant, and other areas and activities are beyond the scope of this PEA and would require future NEPA analyses as projects are finalized. Projects that are slated for development to increase contractor presence would ultimately increase the population of workers reporting to KSC and so commuter emission increases would be anticipated. Though the scale is not known, it would be evaluated as part of the follow-on project evaluations that would be implemented when development planning has become further evolved.

KSC has a Title V Air Operating Permit (number 0090051-040-AV) for Center-wide stationary source emissions. The permit requirements include annual periodic inventory of all significant stationary sources of air emissions for each of the criteria pollutants of concern; monitoring and recordkeeping requirements also are included in the permit.

Implementation of the Proposed Action would contribute directly to emissions of GHGs from the combustion of fossil fuels. The annual estimated emissions of carbon dioxide equivalent is 4,318 metric tpy, for a total of 21,590 metric tons over the course of the five-year short-term construction period. GHG emissions associated with projects further than five years out are unknown, as are operational GHG emissions. GHG emissions from launch activities would require evaluation in separate NEPA analysis once proposed projects are designed. Any additional stationary sources would require evaluation for possible inclusion in KSC's Title V Air Operating Permit. Contractors who would eventually begin to operate at KSC at the completion of development projects would also be required to establish air permits for their operations.

3.1.3.2 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur. There would be no construction activity or increased operations and as a result, there would be no effects to air quality.

3.1.3.3 Other Reasonably Foreseeable Environmental Effects

Reasonably foreseeable environmental effects to air quality from potential development in the Project Area are discussed in **Table 3.1-2.**

Table 3.1-2 Reasonably Foreseeable Environmental Effects to Air Quality

Reasonably Foreseeable Projects	*Geographic Overlap*	*Reasonably Foreseeable Effects*
Final EA and FONSI for the Replacement of the Administrative Building Complex and Construction of the Next Big Thing Experience at KSC, April 2024	Located within KSC / Not located within Project Area	The projects included in this section have the potential to degrade the quality of air resources located in and around KSC. During periods of construction of other projects within the ROI, the cumulative effects of these projects in conjunction with the Proposed Action would result in increases in regional emissions in
EA for the Construction of a New Retail Warehouse at KSC, December 2023		

Table 3.1-2 Reasonably Foreseeable Environmental Effects to Air Quality		
Reasonably Foreseeable Projects	***Geographic Overlap***	***Reasonably Foreseeable Effects***
EA for Exploration Park North at KSC, August 2021 KSC REC 12714 for Blue Origin Manufacturing Complex Site Improvements, February 2024 KSC REC 12670 for Airbus US Space and Defense site development and building expansion, January 2024 KSC REC 12535 for the development of a railhead on KSC property, November 2023		Brevard County. When considered in conjunction with the effects of reasonably foreseeable actions at KSC, short-term adverse cumulative effects to air quality resources would be anticipated to occur with implementation of the Proposed Action construction activities. The actions are not expected to have significant effects, such as causing Brevard County to experience nonattainment levels of criteria air pollution. Longer term projects would require future NEPA analysis to assess effects.
KSC REC 12900 for New Space Prep Spacecraft Processing Center / KSC Complex, July 2024	Located entirely within Project Area	Activities associated with this project include the construction of three buildings on approximately 92 acres at KSC. Implementation of the Proposed Action is expected to have minimal effects on air resources at KSC. To avoid effects to air resources during construction, mitigation measures will be implemented, and any state and local implementation plans will be followed to reduce emissions and benefit local air quality. At the completion of development projects, contractors would be required to establish air permits for their operations. Therefore, cumulative effects to air resources at KSC are not expected to occur through the implementation of the Proposed Action.
Final Supplemental EA (SEA) and FONSI for the Roberts Road SpaceX Operations Area Expansion and Supporting Infrastructure on KSC, April 2024	Partially located inside Project Area / Entirely located within KSC	This project includes developing approximately 100 acres with infrastructure to support SpaceX operations, including, but not limited to, office space, industrial facilities to support mission success, storage, and manufacturing. Existing utilities would be upgraded, and Saturn Causeway would be widened. Project development is expected to have minimal effects on air resources. Concurrent actions listed in and around the Project Area, when combined with construction activities occurring under the Proposed Action, would result in an increase in localized and regional emissions in Brevard County. Construction and operational activities would be conducted in accordance with permitting regulations while following management practices to mitigate potential negative effects to water resources.

Legend: EA = Environmental Assessment; FONSI = Finding of No Significant Impact; KSC = Kennedy Space Center; NEPA = National Environmental Policy Act.

3.2 BIOLOGICAL RESOURCES

3.2.1 Definition of the Resource

Biological resources include plant and animal species and the habitats within which they occur. For the purposes of this PEA, these resources are analyzed and grouped into the following categories:

- *Vegetation* includes plant associations and dominant constituent species that occur in the Project Area. Wetlands and other waters of the U.S. are discussed in detail in **Section 3.3**. Special status plant species are discussed in more detail below.
- *Wildlife* includes the characteristic animal species that occur in the Project Area. Special consideration is given to bird species protected under the Migratory Bird Treaty Act (MBTA) and EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*. Special status wildlife species are discussed in more detail below.
- *Special Status Species* are those species that are listed, have been proposed for listing, or are candidates for listing under the ESA. The ESA protects federally listed threatened and endangered species and their associated designated critical habitats, as well as species proposed for listing. For the purpose of this PEA, special status species designation is also given to the bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*), both of which are protected under the Bald and Golden Eagle Protection Act (BGEPA) of 1940, as well as species protected by the State of Florida. Under the Florida Endangered and Threatened Species Act of 1988, agencies must follow approved measures and permitting guidelines when a Proposed Action may negatively affect a protected species.

3.2.2 Existing Conditions

3.2.2.1 Vegetation

KSC is comprised of ridge and swale topography where bands of uplands and wetlands run north to south across the complex (NASA KSC, 2016). Uplands are found above elevations where flooding most commonly occurs. The most prominent land cover types for uplands at KSC include oak-palmetto scrub and flatwoods. Oak-palmetto scrub includes oak species such as sand live oak (*Quercus geminate*) and Chapman oak (*Q. chapmanii*) with shrub and bush species, including saw palmetto (*Serenoa repens*) and gallberry (*Ilex glabra*), along with species of herbs and grasses. Flatwoods are similar in species composition to oak-palmetto scrub but lack the presence of scrub oak species. Additionally, ruderal-herbaceous-mowed land cover at KSC are herbaceous areas that are mowed near facilities. Notable remaining land cover types include ruderal-woody and upland hardwood forests (NASA KSC, 2020c). Wetlands are semi-aquatic ecosystems that serve as transitional zones between bodies of water and uplands. The most prominent land cover types for wetlands at KSC include hardwood hammock/wetland forest, saltwater marsh, freshwater marsh, and mangrove swamp. Hardwood hammock/wetland forests are composed of species such as Virginia live oak (*Q. virginiana*) and laurel oak (*Q. laurifolia*). Saltwater marsh contains herbaceous species such as black rush (*Juncus roemerianus*), salt grass (*Distichlis* spp.), and seashore dropseed (*Sporobolus virginicus*). Freshwater marsh species include cattail (*Typha* spp.), beard grass (*Polypogon* spp.), and saw grass (*Cladium jamaicense*). Lastly, mangrove swamp land cover is dominated by white (*Laguncularia racemosa*), black (*Avicennia germinans*), and red mangrove (*Rhizophora mangle*) (NASA KSC, 2020c).

Projects associated with the Proposed Action would occur within the SGBs of the Central Campus/Processing, VAB, and Exploration Launch Districts at KSC. Most of the projects proposed within the Central Campus/Processing District would occur on ruderal-herbaceous vegetation communities in and around preexisting development on the west and central portions of the district. The east side of the district is primarily composed of shrublands with less prominent land cover types, including ruderal-woody, upland hardwood forest, hardwood hammock/wetland forest, and Brazilian pepper. Like the Central Campus/Processing District, most of the projects proposed within the VAB District would occur on ruderal-herbaceous vegetation communities in and around preexisting

development in the northwest corner of the district. The northeastern portion of the district is mainly composed of shrublands with scattered communities of hardwood hammock/wetland forest, oak-palmetto scrub, ruderal-woody, wetland scrub-shrub, and Brazilian pepper. The southwest corner of this district is primarily composed of oak-palmetto scrub and shrublands with small proportions of hardwood hammock/wetland forests. Lastly, the Exploration Launch District is primarily made up of ruderal-herbaceous vegetation communities that exist in and around launch pads and roads, such as the Crawlerway, with shrublands and Brazilian pepper communities existing further off roads closer to the SGBs. The proposed site for LC-48 is primarily shrublands with flatwoods and Brazilian pepper communities on the northern corner. The proposed site for LC-49 is a mosaic of flatwoods, wetland scrub-shrub, hardwood hammock/wetland forest, shrublands, ruderal-woody, saltwater marsh, and ruderal-herbaceous vegetation communities (**Figure 3.2-1**).

Considered the ecological foundation of the IRL, submerged aquatic vegetation (SAV) provides forage and habitat to various wildlife species. Seagrass beds are found in varying sizes along the IRL shoreline, with KSC historically supporting significant amounts of seagrass within its boundaries (NASA KSC, 2022a). Seven species of seagrass with varying distributions can be found along the IRL, with four species and one attached algae species most commonly occurring in KSC waters. The four species of seagrass include shoal grass (*Halodule wrightii*), widgeon grass (*Ruppia martima*), manatee grass (*Syringodium filiforme*), and star grass (*Halophila engelmannii*; NASA KSC, 2020C). Results from the 2025 KSC Summary of Seagrass Trends show that shoal grass contains the highest mean total percent cover within the Banana River at 32%, followed by star grass ranging from 0.23% to 21%. Widgeon grass and manatee grass were not observed in the Banana River in 2025. For the Mosquito Lagoon, shoal grass was the dominant species observed with a mean total percent cover of 78%, followed by widgeon grass at 0.1%. Star grass and manatee grass were not observed in the Mosquito Lagoon in 2025 (Herndon Solutions Group, 2026).

3.2.2.2 Wildlife

Numerous species of reptiles and amphibians are known to occur at KSC. Four species of salamanders have been documented at KSC, including the lesser siren (*Siren intermedia*) and greater siren (*S. lacertina*). Fifteen species of frogs and toads have been documented at KSC, including the southern toad (*Anaxyrus terrestris*), green treefrog (*Hyla cinerea*), and southern leopard frog (*Lithobates sphenocephalus*). Twelve species of lizard are known to occur, including the six-lined racerunner (*Cnemidophorus sexlineatus*), southeastern five-lined skink (*Eumeces inexpectatus*), and green anole (*Anolis carolinensis*). Twenty-seven species of snakes have been documented at KSC including the black racer (*Coluber constrictor*), banded water snake (*Nerodia fasciata*), ribbon snake *(Thamnophis sauritus*), and garter snake (*T. sirtalis*) (NASA KSC, 2020c).

Over 318 bird species have been documented at KSC and MINWR; KSC provides nesting habitat to at least 87 species. With a large extent of wetlands, species of wading birds are commonly found throughout KSC, including the white ibis (*Eudocimus albus*) and great egret (*Ardea alba*). Furthermore, KSC supports 29 species of wintering waterfowl, including the mottled duck (*Anas fulvigula*), blue-winged teal (*Spatula discors*), lesser scaup (*Aythya affinis*), northern pintail (*Anas acuta*), and hooded merganser (*Lophodytes cucullatus*) (NASA KSC, 2020c).

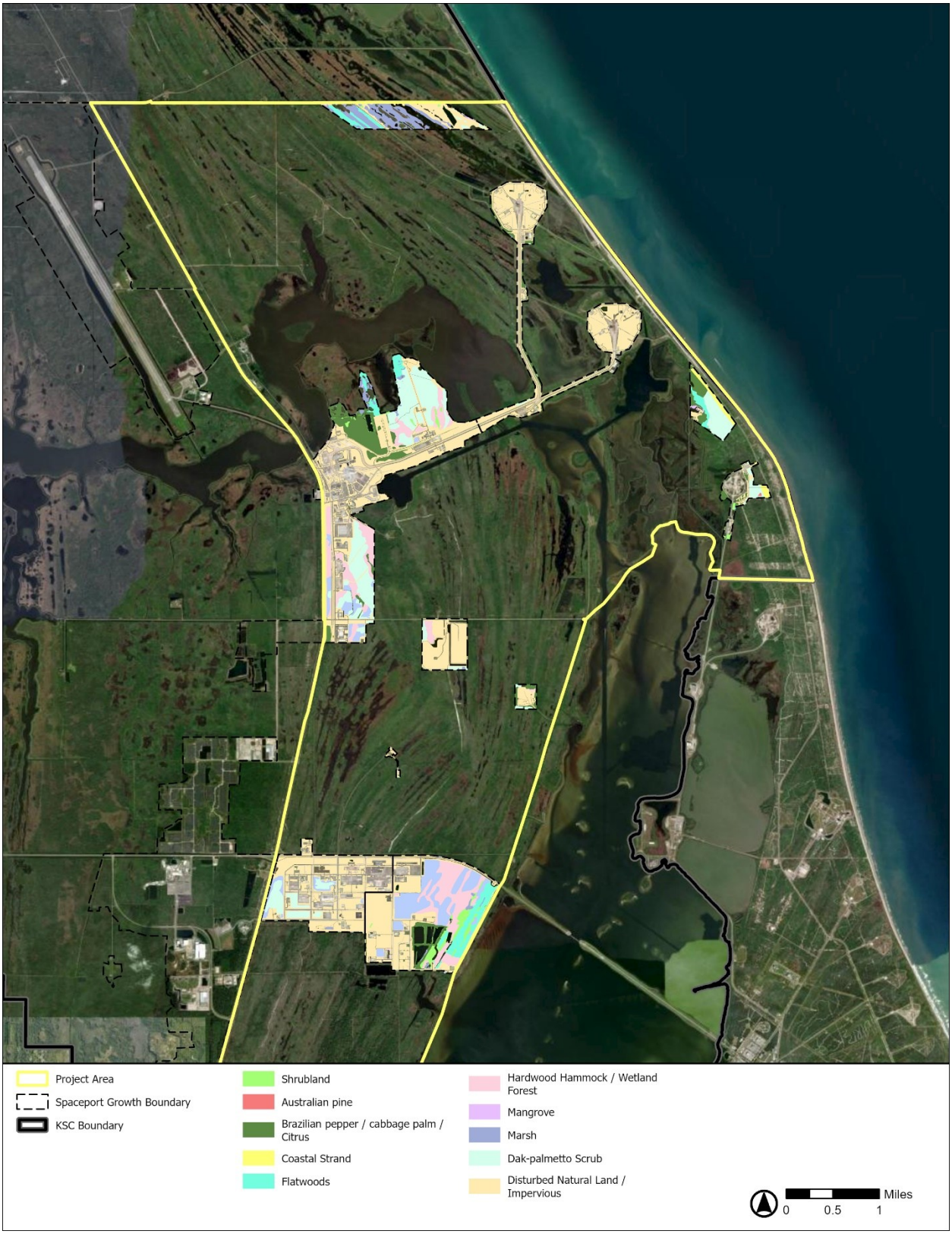

Figure 3.2-1: Vegetation Communities Within the Project Area

Most of the birds that utilize KSC lands for foraging and breeding habitat are protected by federal law under the MBTA and EO 13186. The MBTA makes it unlawful "by any means or manner, to pursue, hunt, take, capture [or] kill" any migratory bird except as permitted by regulation. EO 13186 directs federal agencies to avoid or minimize the negative effects of their actions on migratory birds, and to take active steps to protect birds and their habitats.

Of the 29 mammal species that occur at KSC, 24 are native. Common small mammals found at KSC include the eastern cottontail (*Sylvilagus floridanus),* hispid cotton rat (*Sigmodon hispidus*), Southeastern beach mouse (*Peromyscus polionotus niveiventris*), and cotton mouse (*Peromyscus gossypinus*). Medium to large mammals at KSC include raccoons (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), eastern-spotted skunk (*Spilogale putorius*), gray fox (*Urocyon cinereoargenteus*), bobcat (*Felis rufus*), coyote (*Canis latrans*), and river otter (*Lutra canadensis*). Furthermore, the Brazilian free-tailed bat (*Tadarida brasiliensis*) and the southeastern bat (*Myotis austroriparius*) have established colonies on KSC land. Common non-native mammals found at KSC include the black rat (*Rattus rattus*), coyote (*Canis latrans*), wild boar (*Sus scrofa*), nine-banded armadillo (*Dasypus novemcintus*), and red fox (*Vulpes vulpes*). Feral populations of house cats (*Felis domesticus*) can also be found at KSC (NASA KSC, 2020c).

3.2.2.3 Special Status Species

To assess the potential for federally listed, proposed, and candidate species to occur in the Project Area, an Information for Planning and Consultation search was conducted for KSC (USFWS, 2024). **Table 3.2-1** lists the federally and state protected species that may occur, their known habitats, and their potential to occur in the Project Area.

Critical habitats for four species occur at KSC for the green sea turtle, loggerhead sea turtle, rufa red knot, and the West Indian manatee. The Atlantic shoreline on the eastern edge of the Exploration Launch District is proposed critical habitat for the green sea turtle and is designated as critical habitat for the loggerhead sea turtle and rufa red knot. Critical habitat for manatees in the Exploration Launch District includes the Atlantic Shoreline and the Banana River, south of LC-39. The VAB District critical habitat includes the Banana Creek and into the VAB turn basin and channel, which are part of the Banana River. Lastly, the Central Campus District borders the Banana River, which the proposed Roy D. Bridges Bridge would cross (**Figure 3.2-2**; USFWS, 2024).

KSC, combined with the adjacent CCSFS, provides habitat for the Florida scrub-jay. Restoration of degraded habitat in areas most important to the KSC scrub-jay population is described in the *Kennedy Space Center Florida Scrub-Jay Compensation Plan* (NASA KSC, 2014). The KSC scrub-jay population and habitat have declined for over 20 years, with this population currently estimated to be at about one-half carrying capacity (NASA KSC, 2014). Causes of past declines at KSC are similar to those observed across the species' range and include habitat destruction, fragmentation, and degradation. These federal properties provide habitat for one of three remaining core Florida scrub-jay populations across the species range. Designated conservation area for the scrub-jay overlaps all three districts as depicted in **Figure 3.2-2**. Three types of scrub-jay habitat zones (core, support, and auxiliary) have been defined on KSC to categorize the importance and roles of different landscapes for maintaining scrub-jay populations; spatial extents of these zones are shown in **Figure 3.2-3** (NASA KSC, 2014). On KSC, core scrub-jay areas are described as primary habitat (oak scrub on well drained soils) and adjacent secondary habitat (large oak scrub ridges on poorly drained soils) that provide large contiguous clusters of territory (NASA KSC, 2014). Support areas emphasize smaller clusters of core territory outside of fire management units which

may enhance population size and provide connectivity between population cores. Auxiliary areas are mostly tertiary territories but include some primary and secondary territories generally outside of fire management units. Florida scrub-jay biology and ecology, as well as its status and trends throughout its range on KSC, are described in *Programmatic Biological Opinion for Kennedy Space Center Florida Scrub-Jay Compensation Plan* (USFWS, 2013b).

Due to its proximity to the Atlantic Ocean, the nearshore waters off of KSC's eastern boundary have the potential to provide habitat for a variety of fish species. Three federally-listed endangered fish species that may transit through the area include the Atlantic sturgeon *(Acipenser oxyrinchus*), Giant oceanic manta ray (*Mobula birostris*), and Smalltooth sawfish (*Pristis pectinata*). The Atlantic sturgeon and giant manta ray could be present within the waters near the Project Area, but their low abundance and transient nature makes project-related effects possible but not plausible. Proposed projects may pose risks to fish species through direct strike and increased turbidity. However, it would be extremely unlikely for these species to be directly struck by equipment in the nearshore environment as fish would be expected to easily move away from the area. Turbidity involving sand movement may occur locally during several construction projects but is expected to be temporary and negligible. While it is expected that construction and operation of the proposed projects would have no effect listed fish species, once specific details of each proposed project are known, a re-evaluation of potential site-specific effects would be completed using the KSC Environmental Checklist and additional analysis would be conducted as warranted.

Figure 3.2-2. Habitats of Concern at KSC

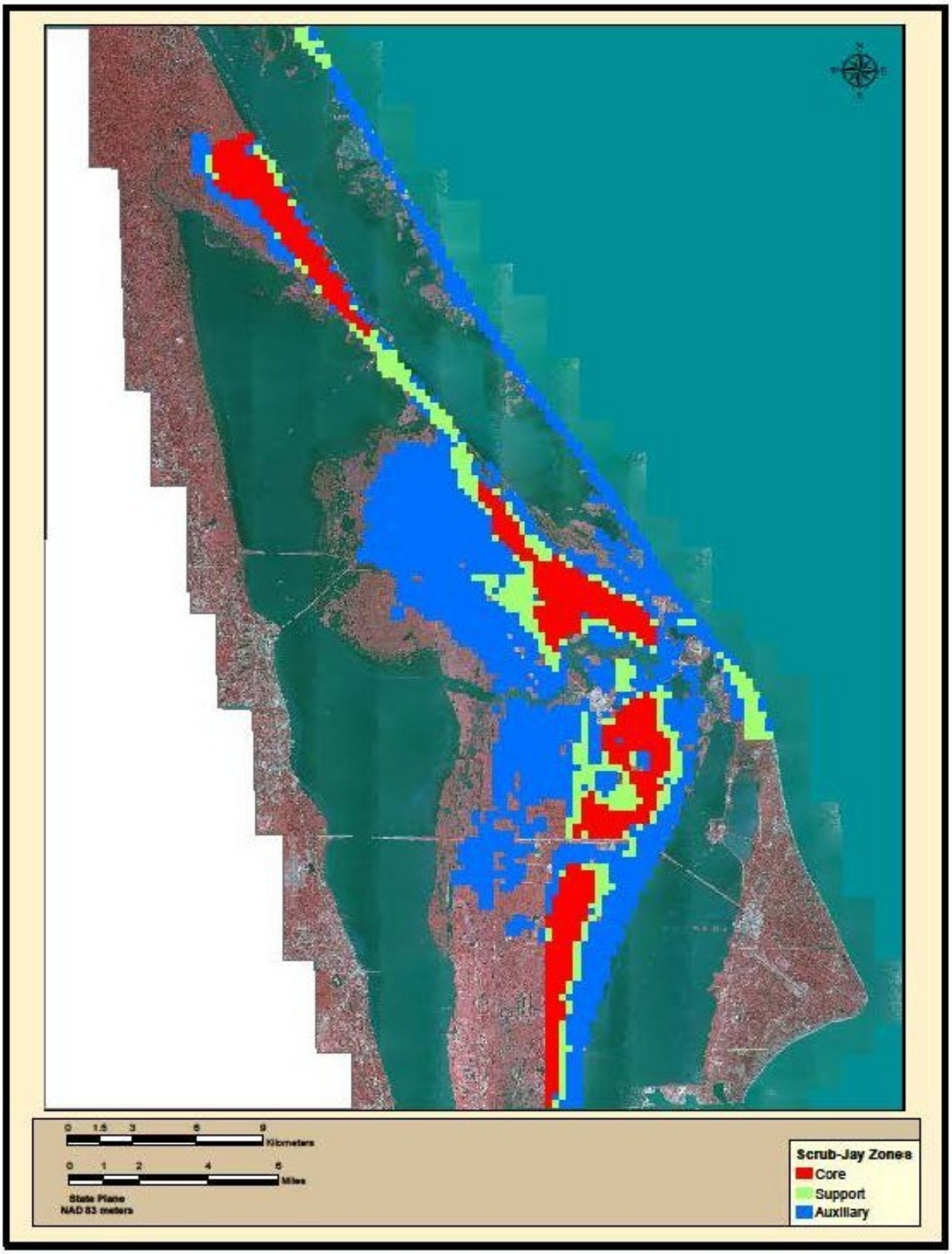

Figure 3.2-3. Florida Scrub-Jay Zones on KSC

Table 3.2-1. Special Species Status with Potential Occurrences within Project Area

Common Name	Scientific Name	Status	Potential Occurrences	Habitats Utilized
Birds				
Little blue heron	*Egretta caerulea*	ST	All Districts	Wetlands (marshes, lagoons, ditches)
Tricolored heron	*Egretta tricolor*	ST	All Districts	Wetlands (marshes, lagoons, ditches)
Reddish egret	*Egretta refescens*	ST	All Districts	Coastal Areas (estuaries, lagoons, salt marshes)
Roseate spoonbill	*Ajaia ajaja*	ST	All Districts	Wetlands (bays, estuaries, marshes)
Southeastern American kestrel	*Falco sparverius paulus*	ST	All Districts	Open woodlands, savannah pine habitats
Florida sandhill crane	*Grus canadensis pratensis*	ST	All Districts	Freshwater marshes, prairies, pastures
American oystercatcher	*Haematopus palliatus*	ST	All Districts	Saltmarshes, barrier beaches, coastal dunes
Least tern	*Sterna antillarum*	ST	All Districts	Coastal estuaries and bays
Black skimmer	*Rynchops niger*	ST	All Districts	Coastal beaches, rivers, saltmarshes
Wood stork	*Mycteria americana*	FT	All Districts	Mixed hardwood swamps, mangroves, marshes, impoundments, ditches
Rufa red knot	*Calidris canutus rufa*	FT	All Districts	Bays, estuaries, tidal flats
Florida scrub-jay	*Aphelocoma coerulescens*	FT	All Districts	Scrub, flatwoods, saw palmetto ground cover, coastal dunes, strand habitat
Bald eagle	*Haliaeetus leucoephalus*	BGEPA	All Districts	Coastal areas, bays, rivers, lagoons, lakes, pine flatwoods for nesting and foraging of roadsides
Eastern black rail	*Laterallus jamaicensis*	FT	All Districts	Most all habitats on KSC
Piping plover	*Charadrius melodus*	FT	All Districts	Sand spits, tidal flats, sandbars, coastal dunes
Roseate tern	*Sterna dougallii*	FT	All Districts	Coastal bays, estuaries, oceans
Crested caracara	*Caracara plancus audubonii*	FT	All Districts	Wet prairies with cabbage palm, wood areas with saw palmetto, cypress, scrub oak
Everglade snail kite	*Rostrhamus sociabilis plumbeus*	FE	All Districts	Freshwater marshes and shallow vegetated edges of water bodies
Mammals				
Southeastern beach mouse	*Peromyscus polionotus niveiventris*	FT	Exploration Launch District	Ruderal areas, coastal strand/swale, coastal sand dunes, oak scrub
West Indian manatee	*Trichechus manatus*	FT	All Districts	Coastal areas, rivers, saltwater bays, estuaries
Tricolored bat	*Perimyotis subflavus*	PE	All Districts	Grasslands, urban areas, woodlands, man-made structures
Reptiles and Amphibians				
Gopher tortoise	*Gopherus polyphemus*	ST	All Districts	Coastal dunes, man-made structures, scrub, saw palmetto, flatwoods, ruderal
Atlantic salt marsh snake	*Nerodia clarkia taeniata*	FT	All Districts	Coastal salt marshes and mangrove swamps
Florida pine snake	*Pituophis melanoleucus mugitus*	ST	All Districts	Dry, upland, sandy soils
Eastern indigo snake	*Drymarchon couperi*	FT	All Districts	All habitat types with suitable densities, including dikes and man-made structures
American alligator	*Alligator mississippiensis*	FT (S/A)	All Districts	Freshwater swamps, ditches, ponds, estuarine waters, marshes, rivers, lakes
Loggerhead sea turtle	*Caretta caretta*	FT	All Districts	Coastal beaches (nesting), inshore bays, lagoons, marshes (development), marine waters
Green sea turtle	*Chelonia mydas*	FT	All Districts	Coastal beaches (nesting), inshore bays, lagoons, marshes (development), marine waters

Table 3.2-1. Special Species Status with Potential Occurrences within Project Area

Common Name	Scientific Name	Status	Potential Occurrences	Habitats Utilized
Leatherback sea turtle	*Dermochelys coriacea*	FE	Exploration Launch District	Coastal beaches (nesting) and marine waters
Kemp's Ridley sea turtle	*Lepidochelys kempii*	FE	All Districts	Coastal beaches (nesting), inshore bays, lagoons, marshes (development), marine waters
Hawksbill sea turtle	*Eretmochelys imbricata*	FE	Exploration Launch District	Coastal beaches (nesting) and marine waters
Insects				
Monarch butterfly	*Danaus plexippus*	FC	All Districts	Flowering plants, coastal areas, wetlands, urban areas
Flowering Plants				
Carter's mustard	*Warea carteri*	FE	All Districts	Scrubby flatwoods, inland, coastal scrub
Lewton's polygala	*Polygala lewtonii*	FE	All Districts	Scrubby flatwoods, scrub

Source: NASA KSC, 2020c; NASA KSC, 2022a; NASA KSC, 2016; USFWS, 2024

Legend: BGEPA = Bald and Golden Eagle Protection Act; FC = Federal Candidate; FE = Federally Endangered; FT = Federally Threatened; FT (S/A) = Federally Threatened Similarity of Appearance; PE = Proposed Endangered; ST = State Threatened.

3.2.3 Environmental Consequences

The significance of potential effects to biological resources is based on: (1) the importance (i.e., legal, commercial, recreational, ecological, or scientific) of the resource; (2) the proportion of the resource that would be affected relative to its occurrence in the region; (3) the sensitivity of the resource to proposed activities; and (4) the duration or ecological ramifications of the effect(s). Effects to biological resources would be significant if species or habitats of concern were adversely affected over relatively large areas or if disturbances caused reductions in population size or distribution of a special status species.

3.2.3.1 Proposed Action

The Proposed Action involves construction, renovation, and demolition projects within the Central Campus/Processing, Exploration Launch, and VAB Districts. Under the Proposed Action, approximately 253 acres of land within the three districts would be developed. Once specific details of each proposed project are known, a re-evaluation of potential site-specific effects would be completed using the KSC Environmental Checklist and additional analysis would be conducted as warranted.

Construction Effects

Vegetation

The majority of construction and renovation projects would occur within previously disturbed areas and could result in minor adverse effects to existing vegetation. Projects in previously undisturbed areas would include construction of a new Payload Processing Facility within the VAB District [Project C] and the LC-49 within the Exploration Launch District [Project N]. Minor adverse effects to native vegetation are expected due to clearing, trampling from vehicles, and foot traffic during construction. However, the effects from trampling are expected to be temporary, and vegetation is expected to recover over time. To minimize the effects caused during construction activities BMPs would be followed and include delimiting the footprint of the project site to reduce effects to surrounding vegetation. Effects would be minimized and avoided during the design of each project as required by state and federal regulations.

Vegetation communities in the direct vicinity of construction activities within the Proposed Action include ruderal-herbaceous, ruderal-woody, hardwood hammock/wetland forest, Brazilian pepper, oak-palmetto scrub, mangrove swamp, coastal strand, and fresh/saltwater marshes. Vegetation trampling,

removal, and mortality from equipment and earth-moving activities during construction would threaten native vegetation communities located in and around the project footprint, which would be at a greater risk of invasive plant establishment after construction activities are completed. Invasive species found at KSC, including the Brazilian pepper (*Schinus terebinthifolius*) and Australian pine (*Casuarina equisetifolia*), may outcompete native vegetation and become established in newly disturbed areas. BMPs such as washing construction equipment before and after entering or leaving the construction site, would minimize invasive plant establishment. Additionally, monitoring and management programs to remove invasive species and revegetate disturbed areas with native vegetation would further minimize invasive plant establishment in areas affected under the Proposed Action.

Benthic resources, including SAV, within the IRL and KSC boundaries are not expected to be significantly impacted by construction activities under the Proposed Action. Most projects associated with the Proposed Action would occur on land with no in-water work. However, projects such as Project O (replace Roy D. Bridges Bridge) in the Central Campus/Processing District and project F (connect Banana Creek and Indian River Lagoon) in the Vehicle Assembly Building District may require in-water work. Project O would occur on the western and eastern shores of the Banana River, where seagrass is known to occur. Project F would occur immediately north of the Vehicle Assembly Building which contains no SAV. However, SAV can be found at the delta of the Banana Creek and Indian River Lagoon and may be affected under the Proposed Action. For projects requiring in-water work, BMPs will be implemented to ensure sedimentation, construction debris, and nutrients are prevented from entering the IRL as a decline in water clarity negatively impacts seagrass growth and distribution (Herndon Solutions Group, 2026). KSC will consult with appropriate agencies to obtain any required permits (i.e., NPDES Stormwater Construction Permit issued by the FDEP) before construction activities begin. Moreover, KSC will continue to adhere to the FDEP Total Maximum Daily Load requirements for the Indian River, Banana River, and Mosquito Lagoon during construction activities to comply with the CWA (NASA KSC, 2022a).

While some long-term effects to native vegetation would occur from removal or destruction during construction, overall effects to vegetation would be minimized by reducing the area of disturbance through BMPs to ensure only necessary land is being disturbed to complete construction projects. Additionally, most native vegetation is expected to recover from short-term effects due to trampling, and measures would be taken to reduce the risk of invasive species growth. Therefore, vegetation in the vicinity of the Project Area may experience minor adverse effects from the Proposed Action.

Wildlife

Temporary, short-term effects are expected to occur to wildlife from construction activities associated with the Proposed Action. Increased noise from construction equipment, delivery vehicles hauling supplies to the designated areas, and increased human presence has the potential to disturb wildlife and temporarily displace wildlife species near the Project Area. Construction activities would cause most wildlife to startle or exhibit escaping behavior, avoiding areas within the direct vicinity of the Proposed Action. Bird species in the Project Area, such as herons and eagles, would be susceptible to disturbances from noise and lighting, and if construction activities were to occur during the nesting season, it could cause nest abandonment, fledging, and decreased feeding from habitat avoidance. Species that leave the construction areas may experience increased competition and predation.

Increased vehicle traffic from construction activities can increase the threat of vehicular collisions with wildlife, especially those species with limited mobility, and can potentially cause direct mortality to wildlife species. However, wildlife is expected to avoid areas with active construction activities, and BMPs would be implemented to reduce the risk of vehicular impacts from the increase in traffic.

Minor adverse effects to wildlife are expected due to noise, lighting, and limited habitat loss from construction of undeveloped areas under the Proposed Action. While construction would temporarily displace wildlife, species currently inhabiting the areas, such as coyotes and rabbits, in and around the proposed construction sites are assumed to be accustomed to increased noise from human activity through preexisting day-to-day operations at KSC. Only a small proportion of wildlife would be affected through construction activities, and affected wildlife, especially wide-ranging species that most likely already avoid busy areas, may temporarily relocate to nearby areas until construction activities were completed. Construction activities would be short-term, and wildlife would be expected to repopulate suitable habitat areas once construction activities are completed.

Special Status Species

Effects to special status species at KSC are expected to be minor from construction activities associated with the Proposed Action. **Table 3.2-2** shows construction projects in the Central Campus/Processing, Exploration Launch, and VAB Districts that are proposed to occur in the direct vicinity of habitats utilized by special status species at KSC.

Construction activities associated with the Proposed Action involving excavation and ground disturbance can cause increased erosion and sedimentation runoff which can degrade water quality and integrity of wetlands. Projects such as the 3rd Street SE extension, roadway elevation and stabilization projects to Banana River Drive and Phillips Parkway, construction of launch infrastructure, and construction of a new Payload Processing Facility could result in direct effects to wetlands through being filled, disturbed during construction activities, or polluted from heavy machinery. Furthermore, toxic compounds and heavy metals from construction equipment could leach into nearby waterbodies and wetlands causing further deterioration of wetlands. Wetland degradation would negatively affect special status species which utilize wetlands at KSC for foraging and nesting, such as the little blue heron (see **Table 3.2-1)**. Mitigation efforts to reduce wetland quality degradation would include a National Pollutant Discharge Elimination System (NPDES) Stormwater Construction Permit issued by the Florida Department of Environmental Protection (FDEP) and utilizing BMPs such as limiting impervious surfaces to the greatest extent possible during construction activities. Furthermore, any NASA activity which may affect wetlands is subject to the KSC Environmental Checklist to determine whether further environmental review is warranted (NASA KSC, 2020c).

Special status species that inhabit uplands at KSC may be subject to increased disturbances from construction activities within the Proposed Action. Noise from construction activities can temporarily displace wildlife species, causing them to avoid areas within the direct vicinity of the Proposed Action. Increased noise would occur from construction equipment, delivery vehicles hauling supplies to the designated areas, and increased human presence. It is expected that special status species would utilize nearby suitable habitats for the duration of construction activities. Therefore, only short-term effects to special status species which utilize uplands at KSC are expected to occur during construction activities associated with the Proposed Action.

Noise and lighting from construction activities can also disturb special status species found at KSC. Sea turtle species use coastal beach habitat for nesting, and construction projects would occur outside the nesting season to ensure these species are minimally affected through construction projects of the Proposed Action. Upgrades to stormwater treatment infrastructure and Phillips Parkway would occur in the vicinity of coastal dune and beach habitat, not directly on this habitat. Because of this, effects to special status species utilizing coastal habitats are not likely to be adversely affected under the Proposed Action. Based on the proposed projects, coastal dune habitat will be modified by construction activities. Several miles of KSC beach and dune will be renourished (sand is likely to be dredged from nearshore sand shoals). This is necessary to protect launch assets and will have positive effects for some species (i.e., better nesting opportunities for sea turtles), and effects from these activities may not be considered minor or temporary. Additional NEPA analysis may be required once project details are completed.

Construction activities associated with the Proposed Action in the direct vicinity of water bodies in and around KSC are expected to minimally affect special status species. Long-term habitat loss is expected to occur with disturbance and removal of scrub habitat and the filling of wetlands within the Project Area, which would negatively affect special status species which utilize them. Some species such as the monarch butterfly (*Danaus plexippus*) may experience long-term habitat loss effects from the Proposed Action due to their dependency as pollinators on specific plant life, thus impacting their available migration range (USFWS, 2025). Like wetlands, construction projects involving excavation and ground disturbance can cause increased erosion and sedimentation runoff which can degrade water quality of water bodies in the vicinity of construction projects. Furthermore, erosion and sedimentation runoff can increase water turbidity which can negatively affect benthic resources and SAV which is utilized by the West Indian manatee, sea turtles, and fish species that inhabit water bodies at KSC for foraging and habitat (NASA KSC, 2022a). However, mitigation efforts to reduce water quality degradation would include an NPDES Stormwater Construction Permit issued by the FDEP and utilizing BMPs, such as limiting impervious surfaces to the greatest extent possible during construction activities. Therefore, special status species utilizing water bodies at KSC are not likely to be adversely affected under the Proposed Action.

Once specific details of each proposed project are known, a re-evaluation of potential site-specific effects on special status species would be completed using the KSC Environmental Checklist. Additional NEPA analysis may be required, as well as consultation under Section 7 of the ESA, and would be conducted if there is a potential for adverse effects on threatened and endangered species.

Table 3.2-2. Special Status Species Habitat Utilization Within the Project Area

Habitat	Species	Central Campus/Processing District Projects	Vehicle Assembly Building District Projects	Exploration Launch District Projects
Wetlands	• Little blue heron • Tricolored heron • Reddish egret • Roseate spoonbill • Florida sandhill crane • Black skimmer • Wood stork	• **P:** Demolish Central Campus Headquarters Phase 2 • **V:** Extend 3rd Street Southeast	• **C:** Construct Payload Processing Facility • **D:** Upgrade Saturn Causeway Utilities • **F:** Modify/Stabilize Roadways to Mitigate Climate Change Impacts • **J:** Critical Facility Flood Fortification	• **B:** Implement Scrub Habitat Mitigation Strategies • **D:** Construct liquefied natural gas line to Phillips Parkway • **E:** Upgrade Stormwater Treatment Infrastructure • **F:** Enable/Construct LC-48

Table 3.2-2. Special Status Species Habitat Utilization Within the Project Area

Habitat	Species	Central Campus/Processing District Projects	Vehicle Assembly Building District Projects	Exploration Launch District Projects
	• Rufa red knot • Bald eagle • Eastern black rail • American oystercatcher • Least tern • Piping plover • Crested caracara • Everglade snail kite • Atlantic salt marsh snake • Monarch butterfly		• **K:** Construct Centralized Warehouse • **L:** Construct Centralized Maintenance Complex • **M:** Upgrade/Expand State Road 3 Payload Transportation • **O:** Construct Advanced Exploration Processing Facility	• **G:** Improve LC-39B Bypass Road • **H:** Renovate Phillips Parkway Roadway • **J:** Elevate/Improve Phillips Parkway • **K:** Improve Titusville Beach Road Access • **L:** Create Titusville Beach Road Utility Corridor • **N:** Construct LC-49 Future Medium/Heavy Launch Capacity • **O:** Construct Future Small-Class Vehicle Landing Site • **P:** Construct Future Landing Site
Uplands	• Southeastern American kestrel • Florida scrub-jay • Bald eagle • Crested caracara • Gopher tortoise • Florida pine snake • Eastern indigo snake • Tricolored bat • Monarch butterfly • Carter's mustard • Lewton's polygala	• **V:** Extend 3rd Street Southeast	• **C:** Construct Payload Processing Facility • **D:** Upgrade Saturn Causeway Utilities • **F:** Modify/Stabilize Roadways to Mitigate Climate Change Impacts • **J:** Critical Facility Flood Fortification • **K:** Construct Centralized Warehouse • **M:** Upgrade/Expand State Road 3 Payload Transportation • **O:** Construct Advanced Exploration Processing Facility	• **C:** Replace LC-39 Area Duct Bank • **F:** Enable/Construct LC-48 • **G:** Improve LC-39B Bypass Road • **J:** Elevate/Improve Phillips Parkway • **K:** Improve Titusville Beach Road Access • **L:** Create Titusville Beach Road Utility Corridor • **N:** Construct LC-49 Future Medium/Heavy Launch Capacity • **O:** Construct Future Small-Class Vehicle Landing Site • **P:** Construct Future Landing Site

Table 3.2-2. Special Status Species Habitat Utilization Within the Project Area

Habitat	Species	Central Campus/Processing District Projects	Vehicle Assembly Building District Projects	Exploration Launch District Projects
Coastal Dunes and Beaches	• Reddish egret • American oystercatcher • Least tern • Black skimmer • Bald eagle • Piping plover • Little blue heron • Tricolored heron • Roseate spoonbill • Gopher tortoise • Eastern indigo snake • Loggerhead sea turtle • Green sea turtle • Leatherback sea turtle • Kemp's Ridley sea turtle • Hawksbill sea turtle • Southeastern beach mouse • Monarch butterfly • Carter's mustard • Lewton's polygala			• **A:** Conduct Dune/Beach Restoration • **E:** Upgrade Stormwater Treatment Infrastructure • **H:** Renovate Phillips Parkway Roadway
Water Bodies (Bays, Rivers, Estuaries)	• Reddish egret • Roseate spoonbill • Black skimmer • Rufa red knot • Bald eagle • Roseate tern • Little blue heron • Tricolored heron • Wood stork • Black skimmer • Least tern • Everglade snail kite • Loggerhead sea turtle • Green sea turtle	• **O:** Replace Roy D. Bridges Bridge • **X:** Banana River Drive Sea-Level Rise Stabilization	• **Q:** Connect Banana Creek and Indian River Lagoon	• **D:** Construct liquefied natural gas line to Phillips Parkway • **E:** Upgrade Stormwater Treatment Infrastructure • **P:** Construct Future Landing Site • **Q:** Connect Banana Creek and Indian River Lagoon

Table 3.2-2. Special Status Species Habitat Utilization Within the Project Area				
Habitat	**Species**	**Central Campus/Processing District Projects**	**Vehicle Assembly Building District Projects**	**Exploration Launch District Projects**
	• Kemp's Ridley sea turtle • West Indian manatee • Atlantic sturgeon			

Legend: LC = Launch Complex.

Operational Effects

Vegetation

Operational effects to vegetation communities in and around KSC are expected to be temporary and minor under the Proposed Action. Similar to effects from construction, vegetation trampling, removal, and possible mortality from equipment during operational activities would threaten native vegetation communities located in and around the project footprint. Because operational activities for most projects would occur on previously disturbed land, potential effects are expected to be minimal.

Section 7(a)(1) of the ESA directs all federal agencies to aid in the conservation of listed species. ESA section 7(a)(2) requires agencies to ensure that their activities will not jeopardize the continued existence of federally listed species or destroy or adversely modify designated critical habitat. To ensure compliance with ESA section 7(a)(1), prescribed fires must be conducted in priority portions of KSC to maintain habitat for the federally listed Florida scrub-jay and Eastern indigo snake (NASA KSC, 2024g). Because many of the vegetation types found on Merritt Island are fire-maintained, without regular fire the vegetative fuel loads in these communities quickly become heavy. Using prescribed fire to keep fuel loads at manageable levels is critical to minimizing the intensity of wildfires and reducing the associated risks to people and built and natural infrastructure, as well as ensuring regulatory compliance and maintaining the health of the fire-dependent species and habitats onsite (NASA KSC, 2024g). Without fire, habitats often become overgrown, in some cases to the point where certain species can no longer persist there.

The USFWS MINWR is the land manager for undeveloped lands throughout KSC. MINWR has divided KSC into numerous burn units with a goal of conducting prescribed fire in each unit on a 3-to-5-year rotation. A recent history of controlled burns can be seen on **Figure 3.2-4**. The Proposed Action could affect MINWR's prescribed burning program, which could negatively impact the quality of listed species habitat within KSC. A Memorandum of Understanding (MOU) was created between KSC, USFWS, and SLD 45 that establishes and defines a coordinated process through cooperative guidelines that allow USFWS to conduct prescribed burns on CCSFS and KSC while protecting personnel, infrastructure, and spaceflight hardware (NASA KSC, 2025b). It allows each signatory to conduct prescribed burns on their respective lands with the intent of not impacting mission operations on either KSC or CCSFS (NASA KSC, 2025b). The MOU is an important tool that these agencies will use to achieve ESA regulatory requirements by including language in lease agreements with KSC tenants to ensure that tenant activities will not adversely affect MINWR's and KSC's abilities and commitments to natural resource management and protection. Critical elements from the MOU include setting a radius around smoke-vulnerable infrastructure (burn buffers) during prescribed fires; implementation of designated areas where no prescribed fire is allowed within selected timeframes leading up to a launch; installing the necessary

equipment to protect sensitive payload/manufacturing processing or hardware from smoke; and other practices as appropriate.

Operational effects of the Proposed Action are not anticipated to result in significant adverse effects to benthic resources and SAV in the waters surrounding KSC. Proposed activities under the Proposed Action do include some increases of impervious surfaces at KSC. However, KSC can utilize nearby Saint John's River Water Management District (SJRWMD) permitted stormwater detention ponds, which are used to treat stormwater runoff from additional impervious surfaces associated with the Proposed Action to prevent declines in water quality of the IRL. KSC will treat additional stormwater runoff in terms of volume and water quality in compliance with SJRWMD regulations. Moreover, mitigation efforts to reduce water quality degradation would include any required NPDES stormwater construction permit issued by the FDEP, and NASA will continue annual seagrass monitoring efforts as part of the Ecological Monitoring Plan.

Negligible adverse effects to vegetation are expected from operational activities under the Proposed Action since operation does not require additional development and new construction activities. Development and future facilities will accommodate the MINWR-prescribed fire program. Effects would be minimized by implementing BMPs to ensure only necessary land would be disturbed during operations.

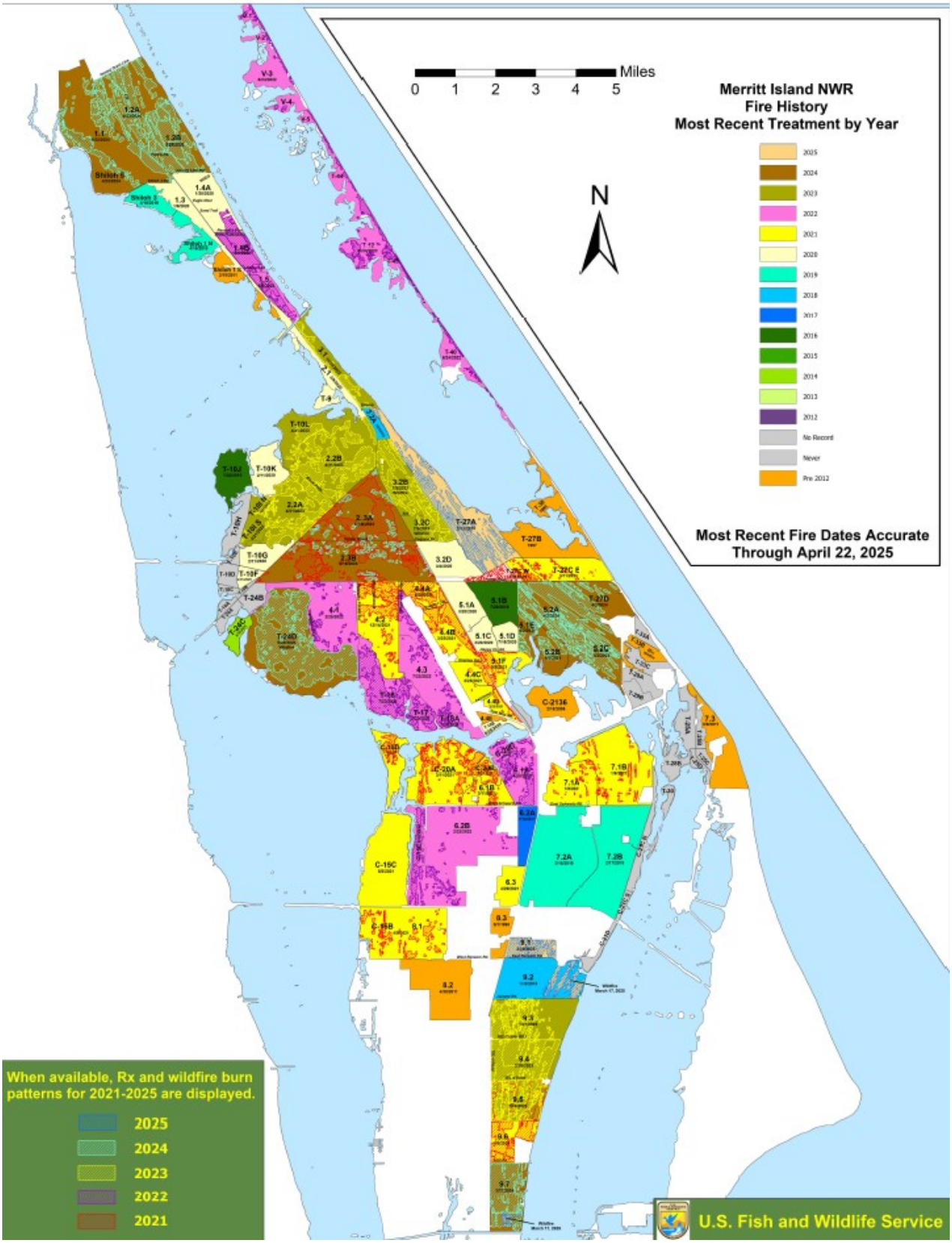

Figure 3.2-4. Controlled Burn History on KSC

Wildlife

Operational effects would largely increase as many of the projects over the 20-year horizon are based on development for increased capacity at KSC. Following construction, increases in ambient noise from projects completed in the Proposed Action area would cause some wildlife species to change their behavior and repeatedly avoid the area. Operational noise from vehicles and human presence (i.e., lighting, equipment, and associated personnel) is expected to increase incrementally over time as a result of future completed projects, and could contribute to altered home ranges, migration patterns, abandonment, fledging, and increased habitat avoidance. Additionally, there is the potential for strikes from vehicles as a result of increased traffic. Lighting from facilities can negatively affect wildlife behaviors within the vicinity but effects from lighting would be short term as wildlife may utilize large areas of nearby suitable habitat.

In the short term, project development would not generally be anticipated to generate significant effects. Wildlife currently inhabiting KSC has been exposed to current operational activities and is either accustomed to or could quickly adapt to additional facility operations at KSC, and wildlife that do not relocate to nearby areas for nesting or foraging would be expected to acclimate. KSC and tenants would implement BMPs to ensure effects are minimized during operations, including adherence to the Lighting Operations Plan for KSC (NASA KSC, 2018).While operational effects to wildlife from increased noise and human presence are anticipated to be minor, the scale is not known but would be evaluated as part of the follow-on project evaluations that would be implemented when development planning has become further evolved. Future development projects in the Project Area would require their own NEPA analysis once specific design and details are known.

Special Status Species

Special status species that utilize coastal dune and beach habitat at KSC are expected to be affected from long-term operations resulting from development projects. New exterior lighting sources could negatively affect sea turtle nesting and the orientation of hatchlings. Current activities to assess the effects of exterior lighting and protection of sea turtles would continue through coordination with USFWS. Within the Vertical Launch District, Project A proposes to implement dune and beach restoration projects which would improve sea turtle nesting habitat and create a natural visual screen and improve southeastern beach mouse habitat that is currently highly disturbed (USFWS, 2010). Furthermore, dune and beach restoration may affect but is not likely to adversely affect sea turtles if protection measures are implemented such as marking and avoiding nests (UWFWS, 2013a).

As previously stated, prescribed fire is a critical and required land management tool required to manage habitat for listed species such as the Florida scrub-jay. Development of facilities may affect MINWR's prescribed burning program, which could negatively impact the quality of listed species habitat. Tennant activities will adhere to BMPs and other agreements in the prescribed burn MOU, which ensures tenants will not adversely affect MINWR's and KSC's abilities and commitments to natural resource management and protection.

Implementation of BMPs would minimize effects to special status species. Tenants and NASA contractors would agree to facilitate and follow implementation of KSC's commitments to natural resource management and protection. Adherence to the Lighting Operations Plan ensures appropriate lighting is available for nighttime operations at KSC, while also minimizing the impact on protected species, including the five federally protected marine turtle species that nest along KSC shorelines.

Roadway improvements and upgrades to stormwater treatment infrastructure would minimize long-term stormwater runoff and sedimentation into water bodies located in and around KSC. Availability of other suitable habitats is not expected to decrease as KSC transitions into a multi-user spaceport. Florida scrub-jay conservation areas have been established in KSC to maintain suitable habitat and promote population connectivity among KSC populations. These conservation areas are outside of the SGBs and are not expected to be affected through the Proposed Action (USFWS, 2013b). An increase in ambient noise is expected due to operation of facilities resulting from the Proposed Action. Operational noise is expected to increase incrementally over time as sites are developed. Increases in ambient noise from projects completed in the Proposed Action area would cause some wildlife species to change their behavior and repeatedly avoid the area. Special status species that do not relocate to adjoining suitable habitat areas would have an opportunity to acclimate.

Though the scale is not known, increases in lighting, noise, vehicles, and human presence would be anticipated. However, some demolition projects would reduce lighting, human presence, and overall disturbance. These effects would be evaluated as part of the follow-on project evaluations when planning is further evolved. Once specific details of each proposed project are known, a re-evaluation of potential site-specific operational effects on special status species would be completed using the KSC Environmental Checklist. Additional analysis would be undertaken, including consultation under Section 7 of the ESA if there is potential for effects to threatened and endangered species.

3.2.3.2 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to biological resources. Therefore, no effects to biological resources would occur with implementation of the No Action Alternative.

3.2.3.3 Other Reasonably Foreseeable Environmental Effects

Reasonably foreseeable environmental effects to biological resources from potential development in the Project Area are discussed in **Table 3.2-3.**

Table 3.2-3. Reasonably Foreseeable Environmental Effects to Biological Resources

Reasonably Foreseeable Projects	*Geographic Overlap*	*Reasonably Foreseeable Environmental Effects*
Final EA and FONSI for the Replacement of the Administrative Building Complex and Construction of the Next Big Thing Experience at KSC, April 2024	Located within KSC / Not located within Project Area	The projects within this section can contribute to negative adverse effects on biological resources at KSC. Construction and Operational portions of these Proposed Actions are expected to cause negligible effects to vegetation, wildlife, and threatened and endangered species. However, species within the direct vicinity of the Proposed Actions can experience habitat loss, displacement, and direct mortality. Species such as the gopher tortoise and Eastern indigo snake are likely to be identified through a biological survey preceding construction activities. If observed, individuals would be relocated to avoid further disturbances. Areas denoted as Florida scrub-jay habitat may be cleared during construction activities associated with these projects. If cleared, habitat improvements must
EA for the Construction of a New Retail Warehouse at KSC, December 2023		
EA for Exploration Park North at KSC, August 2021		
KSC REC 12714 for Blue Origin Manufacturing Complex Site Improvements, February 2024		
KSC REC 12670 for Airbus US Space and Defense site development and building expansion, January 2024		

Table 3.2-3. Reasonably Foreseeable Environmental Effects to Biological Resources		
Reasonably Foreseeable Projects	***Geographic Overlap***	***Reasonably Foreseeable Environmental Effects***
KSC REC 12535 for the development of a railhead on KSC property, November 2023		occur within one year of construction activities to offset habitat loss for the Florida scrub-jay (NASA KSC, 2023). Active bald eagle nests have been noted to occur in the vicinity of the projects identified in REC 12535 and REC 12900. In this case, construction activities cannot occur within 660 feet during the nesting season (September-May) under the Bald and Golden Eagle Protection Act. Implementation of the Proposed Action within each of these projects would have negligible adverse effects if proper mitigation efforts are conducted to offset habitat loss and disturbances. Biological surveys would be completed where appropriate, and proper guidelines would be followed throughout construction and operational portions of these Proposed Actions. Therefore, cumulative effects to biological resources are not expected to occur within the projects listed in this section.

Table 3.2-3. Reasonably Foreseeable Environmental Effects to Biological Resources		
Reasonably Foreseeable Projects	***Geographic Overlap***	***Reasonably Foreseeable Environmental Effects***
KSC REC 12900 for New Space Prep Spacecraft Processing Center / KSC Complex, July 2024	Located entirely within Project Area	The activities proposed within this project have the potential to negatively affect biological resources located within KSC. Specifically, implementing this project can cause adverse effects on the populations of the Florida scrub-jay, Eastern indigo snake, and the gopher tortoise. Mitigation measures must occur to minimize adverse effects on threatened and endangered species. The proposed new infrastructure in this project may affect preexisting burrows from the gopher tortoise. If any burrows are located within the Project Area, the animal must be relocated to avoid further disturbances. If an indigo snake is observed in the Project Area, work will be halted until the snake leaves the area. Presence of these species within the Project Area will be determined by a biological survey preceding construction activities. NASA EMB determined that Florida scrub-jay habitat will be adversely affected in constructing the new spacecraft processing center. This project will cause roughly 51 acres of habitat loss for the Florida scrub-jay, and mitigation efforts will include habitat improvements on approximately 175 acres. Once construction activities start, habitat improvements must be finished within one year (NASA KSC, 2023). Active bald eagle nests have been recorded near the proposed Project Area. Under the Bald and Golden Eagle Protect Act, construction activities during the nesting season (September-May) must be halted if an active nest is within 660 feet of the proposed activities. Construction activities will follow relevant laws and regulations where applicable. Implementing the Proposed Action will not result in cumulative effects on biological resources within KSC.

Table 3.2-3. Reasonably Foreseeable Environmental Effects to Biological Resources		
Reasonably Foreseeable Projects	***Geographic Overlap***	***Reasonably Foreseeable Environmental Effects***
Final Supplemental EA (SEA) and FONSI for the Roberts Road SpaceX Operations Area Expansion and Supporting Infrastructure on KSC, April 2024	Partially located inside Project Area / Entirely located within KSC	This project involves the expansion of Roberts Road Operations Area by 100 acres through the construction of new facilities and upgrading existing infrastructure and widening Saturn Causeway to support vehicle transport to and from launch facilities. Under the Proposed Action, Saturn Causeway utilities would be upgraded under Project D of the VAB District. This project can contribute to negative effects on biological resources through habitat loss and disturbance. Where appropriate, mitigation measures will be followed to keep effects to biological resources to a minimum. No significant effects to biological resources are expected with the Proposed Acton, only minor adverse effects during the construction portion of this project. In implementing mitigation strategies, no significant cumulative effects are expected to occur for biological resources within the proposed activities.

Legend: EMB = Environmental Management Branch; FONSI = Finding of No Significant Impact; KSC = Kennedy Space Center; NASA = National Aeronautics and Space Administration; REC = Record of Environmental Consideration; VAB = Vehicle Assembly Building.

3.3 WATER RESOURCES

3.3.1 Definition of the Resource

Water resources discussed in this section include groundwater, surface water, floodplains, coastal zone, and wetlands that exist within the boundaries of the Project Area for activities associated with the Proposed Action. Water bodies, including lakes, rivers, streams, aquifers, and coastal areas, are protected under the CWA that serves to maintain water body authenticity.

Surface water contributes to the recreational, human health, ecological, and economic well-being of a specific region or community. Surface water includes lakes, rivers, streams, and wetlands. Maintaining the water quality of surface water resources is imperative to an ecosystem and its surrounding resources. Groundwater is comprised of water that saturates soil and rocks; it is stored within aquifers and released into springs and wells. Maintaining the integrity of groundwater is crucial in providing safe conditions for consumption, industrial applications, and agricultural purposes. Floodplains, as defined by EO 11988 *Floodplain Management*, include areas defined as flat, lowland areas that are prone to flooding from adjacent water resources with at least a one percent chance of flooding annually. EO 11988 protects floodplains from significant modification and requires federal agencies to consider the risk of building infrastructure within floodplains. 100-year floodplains are areas that have a 1 percent or greater chance of flooding each year while the 500-year floodplain are areas that have at least a 0.2 percent chance of flooding each year. Wetlands, protected by EO 11990 *Protection of Wetlands* and Section 404 of the CWA and Section 10 of the *Rivers and Harbors Act of 1899*, are sensitive habitats that are subject to increased protection due to their ecological benefits. Wetlands include areas classified as swamps, marshes, and bogs. Coastal zones are areas defined as the border between land and the ocean that supports natural resources and important habitats. Potential negative effects to coastal zones must be considered by federal agencies when implementing a Proposed Action. The State of Florida has a federally approved Coastal Zone Management Program that is fulfilled by the FDEP which enacts 24 statutes and requires a

Coastal Zone Consistency Determination (CCD) when implementing a Proposed Action on or near a coastal zone.

3.3.2 Existing Conditions

Groundwater **–** There are three aquifer systems beneath KSC: the Surficial, Floridan, and the Intermediate Aquifer Systems. The Floridan Aquifer System underlies the entire State of Florida and is the main source of potable water in central Florida (NASA KSC, 2016). The Surficial and Intermediate Aquifer Systems are less productive than the Floridan System and are primarily used for domestic wells or small public supply wells (NASA KSC, 2022a). Mostly recharged by rainfall and surface runoff, the Surficial Aquifer System is used for non-potable uses in areas around KSC. The Intermediate Aquifer System features some clay-containing confining units, which may hinder hydraulic conductivity and is composed of the semi-artesian shell and sand beds, shallow rock aquifer, and hawthorn limestone aquifer (NASA KSC, 2016). Groundwater at KSC flows into the Atlantic Ocean or the Indian River Lagoon (Banana River, Indian River, Mosquito Lagoon) (NASA KSC, 2022a). Sources of groundwater used as potable water are derived from wells located in east Orange County and subsequently subjected to treatment at the Claude H. Dyal Water Treatment Plant in the City of Cocoa. Groundwater aquifers beneath KSC are not utilized for potable water. (NASA KSC, 2020c).

Surface water **–** Located on Merritt Island, KSC is surrounded by the Atlantic Ocean to the east and the Indian River Lagoon System to the north, west, and south. The Indian River Lagoon System is made up of the following bodies of water: the Indian River (borders the western shoreline of KSC), the Banana River (borders the eastern shoreline up to LC-39), Banana Creek (runs east–west in the middle of KSC), and Mosquito Lagoon (borders KSC to the north) – refer to **Figure 1.2-1**.

Surface waters of KSC are classified as either Class II or Class III waters based upon their uses and values. Class II waters designated for shellfish propagation and harvesting are subjected to strict limitations regarding bacterial pollution. The discharge of wastewater into Class II waters is prohibited. Class III waters are designated for recreation and fish and wildlife propagation and do not contain strict limitations like Class II waters. However, Class III waters must maintain qualities that are safe for human recreational purposes and maintain diverse aquatic communities. Class II waters at KSC include Mosquito Lagoon and the northern section of the Indian River. All other surface waters are classified as Class III and include the Banana River between Merritt Island and Cape Canaveral and the Indian River west of Merritt Island (NASA KSC, 2020c). Surface waters at KSC are presented in **Figure 3.3-1**.

KSC abides by NPDES permits that are enforced by the FDEP. Under the CWA, the NPDES manages pollutant discharge from industrial, construction, and municipal activities into waters of the U.S. At KSC, the FDEP issues NPDES permits for wastewater and stormwater that enters waterbodies in and around KSC. Construction projects that disturb ≥1 acre of land or an agency conducts an activity listed in the NPDES regulations are subject to NPDES permitting. Most construction activities at KSC are covered by the Florida Generic Permit for Stormwater Discharge from Large and Small Construction Activities, where coverage is granted when a Notice of Intent is submitted and compliance with permit conditions is followed. Permit conditions include the implementation of a site-specific Stormwater Pollution Prevention Plan (SWPPP), control of erosion and sediments, and routine inspections. The State of Florida also implements the Environmental Resource Permit (ERP) program. The ERP program regulates construction activities that have the potential to pollute surface waters, alter surface water flows, and affect wetlands. An ERP is required by the State of Florida whenever a proposed activity disturbs ≥1 acre

of land, installs or modifies >4,000 ft^2 of impervious or semi-impervious surfaces, installs or modifies >9,000 ft^2 of impervious surfaces, or develops >5 acres of recreational area. The NASA Environmental Assurance Branch (EAB) is responsible for identifying stormwater management and permitting requirements to ensure proposed activities comply with the applicable permits (NASA KSC, 2022b).

Wetlands and Floodplains – KSC is composed of ridge and swale topography where bands of uplands and wetlands run northeast to southwest across the complex (NASA KSC, 2016). Wetlands at KSC include freshwater marshes, saltwater marshes, mangrove swamps, hardwood swamps, mixed swamps, estuarine wetlands, and palustrine scrub-shrub wetlands (NASA KSC, 2022a; **Figure 3.3-1**). With such a large extent of wetlands, KSC conducts delineations when necessary for the completion of a project.

Most of KSC is within the 100-year and 500-year floodplain. Flood zones are determined based on factors, such as elevation, proximity to water bodies, and rainfall patterns. Identified on Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs), these zones have a 1 percent and 0.2 percent chance of experiencing flood conditions each year, respectively (NASA KSC, 2022a). Floodplains within the Project Area are depicted on **Figure 3.3-2**. The Banana Creek and the northern portion of the Banana River are both part of the 100-year flood zone because FEMA has determined they have a 1 percent annual chance of flooding. Areas in the 100-year flood zone are at risk for significant flooding leading to potential property damage and other hazards. Any activity which may affect wetlands or floodplains is subject to the KSC Environmental Checklist to determine whether further environmental review is warranted (NASA KSC, 2020c).

Coastal Zone – Being directly on the Atlantic Coast, KSC contains coastal zones, which are defined as a dynamic area where terrestrial land and marine ecosystems are capable of dynamically influencing one another. Coastal zones support crucial habitats and natural resources and are subject to strict management and regulatory requirements. Florida has a federally approved Coastal Zone Management Plan (CZMP) that is fulfilled by the FDEP. A network of agencies enforces 24 statutes that serve to protect the coastal resources of Florida. As NASA is a federal agency acting in a coastal zone, a CCD is required when a project is subject to state or federal dredge and fill permitting review, a point or new non-point source discharges to surface waters, or major industrial expansion or development projects are proposed (NASA KSC, 2022a).

3.3.3 Environmental Consequences

Water resources in and around KSC include groundwater, surface water, floodplains, coastal zones, and wetlands. Under the Proposed Action, activities would involve the renovation, demolition, and construction of facilities and infrastructure within the Central Campus/Processing, VAB, and Exploration Launch Districts. Effects to the Proposed Action would be considered significant if decreases in water quality are expected or observed, laws and regulations from any level of government are infracted, or current hydrology or aquifer quality is altered. For coastal zone resources, KSC would conduct activities in a manner suitable for Florida's CZMP and would comply with the 24 statutes enforceable by the FDEP. If required, KSC would complete a CCD to ensure protection of resources within the coastal zone located within KSC. Potential negative effects of the Proposed Action on coastal zone resources can occur through non-compliance with the CZMP. Once specific details of each proposed project are known, a re-evaluation of potential site-specific effects on the following resources would be completed using the KSC Environmental Checklist and additional analysis would be conducted as warranted.

3.3.3.1 Proposed Action

Construction Effects

Construction activities associated with the Proposed Action are described in **Section 2.1**. Construction activities will occur only within the SGBs, and effects to water resources are expected to be confined within those boundaries. However, water resources in the direct vicinity of construction activities have the potential to be affected through the implementation of the Proposed Action. Activities that require excavation and ground disturbance can cause increased erosion and sedimentation runoff which can flow into nearby wetlands and waterbodies, thereby negatively affecting the water quality and integrity of these resources. Project C in the VAB District proposes to construct a new Payload Processing Facility on 20 acres of land. Excavation activities can cause erosion and sedimentation runoff into the adjacent freshwater emergent wetland directly east of the proposed site.

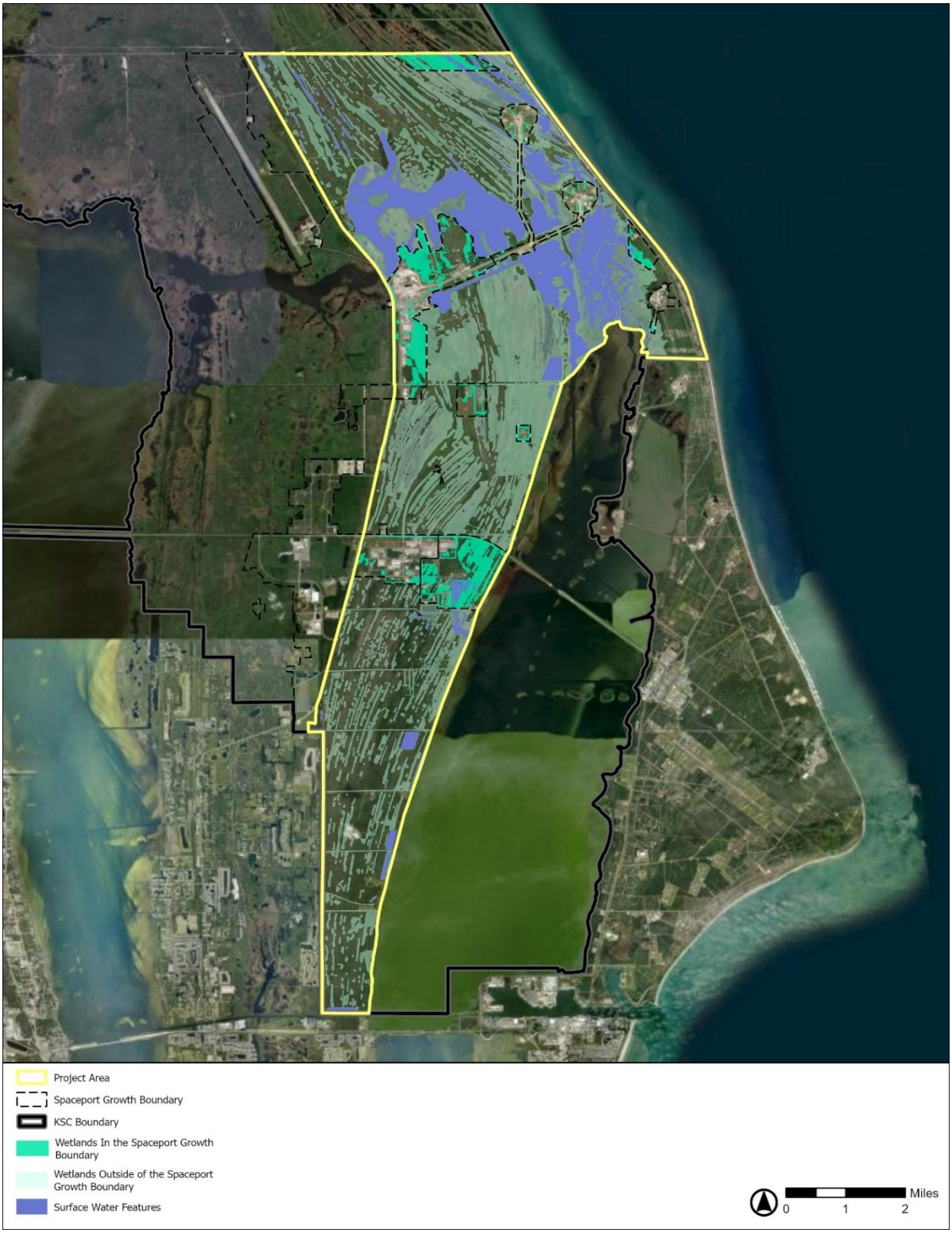

Figure 3.3-1. Wetlands and Water Features of KSC

Figure 3.3-2. Floodplains of KSC

Project N in the Exploration Launch District, construction of LC-49, is a capacity project that may disturb 80 acres of land and cause erosion and sedimentation runoff into adjacent wetlands that include freshwater emergent wetlands and freshwater/forested scrub wetlands. Furthermore, pollution from construction activities can also include toxic compounds and heavy metals from machinery, which can leach into surface waters and wetlands causing decreases in water quality. According to the boundaries depicted on **Figure 2.1-2**, the Exploration District boarders and includes a large portion of the Banana River. Additionally, **Figure 2.1-1** has the boundaries of the VAB District including portions of the Banana Creek. The SGBs border the Banana River in the Central Campus/Processing District and Banana Creek in the VAB District. Projects near the borders of the SGB would utilize BMPs and mitigation measures to ensure water resources both inside and outside of the SGBs are not being negatively affected.

Implementation of the Proposed Action may effect the existing hydrology at KSC. As a federal entity, KSC must abide by Section 438 of the *Energy Independence and Security Act of 2007* as some activities in the Proposed Action involve the construction, demolition, and/or renovation of facilities exceeding 5,000 ft^2. Under this Act, KSC must restore and maintain existing hydrology of the lands at KSC (Section 438). While Brevard County does not mandate low impact development (LID) stormwater management practices, KSC utilizes LID and green infrastructure practices to comply with Section 438. Implementing the Proposed Action while maintaining current hydrology at KSC can be achieved by utilizing LID techniques (i.e., construction of retention or detention ponds, baffle boxes to remove sediments in storm water) within the Project Area. The LID techniques would be applied where applicable to offset any changes to hydrology caused by activities associated with the Proposed Action (Brevard County, 2020).

Groundwater resources analyzed in this section have the potential to be indirectly affected through the implementation of the Proposed Action. Construction activities pose a nominal risk of contamination to the groundwater aquifer systems found beneath the Project Area. Groundwater resources in the immediate vicinity of construction projects can be affected through increased erosion from tree clearing, sedimentation runoff, or pollution from accidental spills from construction equipment. Compliance with existing protocols and BMPs, and applicable federal and state regulations, would minimize effects to groundwater resources; therefore, construction effects on groundwater resources are expected to be negligible (NASA KSC, 2016).

Construction effects to wetlands would be avoided to the greatest extent possible. However, multiple projects within the Proposed Action would directly affect wetlands within the Project Area. Projects such as the 3rd Street Southeast extension, roadway elevation and stabilization projects to Banana River Drive and Phillips Parkway, construction of launch infrastructure, and construction of a new Payload Processing Facility could result in direct effects to wetlands through being filled, disturbed during construction activities, or polluted from heavy machinery. Furthermore, wetlands within Parcels 3 and 4 of the Central Campus/Processing District (see **Figure 2.1-4**) would require mitigation before any future development can be constructed. Mitigation efforts to reduce wetland effects would include an NPDES Stormwater Construction Permit issued by the FDEP with a SWPPP, if disturbing an area greater than one acre, to prevent sedimentation and erosion. Furthermore, a CWA Section 404 permit (U.S. Army Corps of Engineers) and Section 401 Water Quality Certification (St. Johns River Water Management District) is required for any action involving the dredging or filling of wetlands. All proposed projects are subject to the KSC Environmental Checklist to determine potential effects and if further environmental review is warranted.

Projects within the Proposed Action, such as the construction of a Payload Processing Facility and launch infrastructure, would occur directly on wetlands and result in wetlands being permanently filled. However, negative effects would be mitigated through development of an Umbrella Mitigation Bank that would create wetlands outside of the SGBs for species to utilize. This type of wetland mitigation bank is a system designed to compensate for unavoidable impacts to wetland and other aquatic resources due to development. The primary ecological goal of the mitigation bank is to improve fish and wildlife habitat, use/connectivity, and the overall integrity of ecological communities within MINWR and the Indian River Lagoon watershed. Composed of three sites totaling 134 acres, this Umbrella Mitigation Bank would restore, create, and enhance wetlands at KSC:

- Site 35 encompasses 75 acres and is a historical spoil pile and mosquito impoundment. Located on Static Test Road adjacent to the Banana River in Section 33, Township 22 South, Range 37 East, Brevard County, Florida.
- Site 46 encompasses 33 acres and is an abandoned citrus grove. Located west of Kennedy Parkway South and west of the Florida Power and Light (FPL) solar farm in Section 14, Township 23 South, Range 36 East, Brevard County, Florida.
- Site 49 encompasses 27 acres and is an abandoned citrus grove. Located east of Kennedy Parkway South on East Crisafulli Road in Section 30, Township 23 South, Range 36 East, Brevard County, Florida.

Enhancing KSC into a multi-user spaceport would require wetland mitigation credits to offset ecological losses and negative effects to wetlands. Wetland mitigation credits ensure ecological losses caused by development are compensated for by restoring wetlands in another location – therefore resulting in no net loss of wetland functions and values to the environment. The proposed sites would be managed by MINWR and would not allow public or private recreational use. Two of the areas are proposed to be created within the Central Campus/Processing District and include an estuarine wetland north of SE 2nd Street and a palustrine herbaceous wetland south of SE 28th Street. Therefore, habitat replacement would occur when possible and habitat loss through implementation of the Proposed Action is expected to cause minor, long-term effects to wetlands within KSC.

Proposed projects within the SGB are located within the 100- and 500-year floodplain (NASA KSC, 2022a). Projects V (Extend 3rd Street Southeast) and X (Implement Banana River Drive Sea-Level Rise Stabilization), located within the Central Campus/Processing District, are all proposed to occur within the 500-year floodplain. Projects O (Construct Advanced Exploration Processing Facility), P (Expand Wharf Support Facilities/Turn Basin), and G (Construct Supplemental Gaseous Nitrogen (GN_2) Pumping Site) within the VAB District are located within the 100-year floodplain. All projects within the Exploration Launch District, except for Project F (Enable/Construct LC-48), are located within both the 100-year and 500-year floodplains. Furthermore, Parcels 3 and 4 of the Central Campus/Processing District (see **Figure 2.1-4**) are located within the 100-year and 500-year floodplains. Construction projects can disrupt preexisting hydrological patterns through ground compaction from heavy machinery and excavation. This can cause an increase in the volume of runoff and fill material within floodplains leading to a decreased storage capacity of floodplains located within the SGB. Mitigation measures, such as stormwater management plans to control runoff, control measures to reduce sedimentation within floodplains, and monitoring programs, are in place to minimize effects of construction activities on floodplains at KSC. Therefore, construction effects on floodplains located within the SGB are expected to be negligible.

Bordered by the Atlantic Ocean to the east, KSC contains coastal zones supporting crucial ecosystems that are protected by the State of Florida's CZMP. Activities associated with the Proposed Action have the potential to affect coastal resources. The degradation of water quality can occur with construction activities involving earth disturbances, such as excavation. Increased sedimentation and runoff can decrease the water quality in areas around KSC, leading to eutrophication aiding already persistent algal blooms which are detrimental to water resources and biological resources (NASA KSC, 2022a). Construction activities can also cause toxins and heavy metals to leach into sensitive areas in the coastal zone which would further decrease the water quality in the area. However, these potential negative consequences can be avoided in following BMPs and the 24 statutes within the federally approved CZMP enforced by the FDEP. If necessary, KSC would undergo a CCD to evaluate and avoid these potential negative consequences. Therefore, in following protocols and the statutes within the CZMP, the coastal zones within KSC are not expected to be negatively affected through implementing the Proposed Action.

Operational Effects

Once the construction activities in the Proposed Action are completed, day-to-day operations at KSC are not expected to adversely affect water resources, such as coastal zones, surface waters, groundwater, floodplains, or wetlands. Daily operations would continue to follow state and federal regulations and preexisting water permit protocols (NASA KSC, 2022a). Wetland restoration strategies would be implemented throughout KSC to protect and reestablish existing wetlands to maintain and improve their integrity (see discussion of the Umbrella Mitigation Bank in *Construction Effect*s) and include an estuarine wetland north of SE 2nd Street and a palustrine herbaceous wetland south of SE 28th Street. All proposed sites are outside of the SGB and are not expected to be affected by the Proposed Action (NASA KSC, 2022a).

Multiple projects associated with the Proposed Action would provide long-term benefits to water resources at KSC once completed. Within the Central Campus/Processing District, projects would include upgrading the sewage conveyance system (Project F) by constructing new force main systems and refurbishment of surge tanks, pumps, and controls. This district would also see the implementation of stormwater improvements (Project H) by upgrading drainage systems to reduce road flooding and improve stormwater treatment before discharge, improving water quality in the Indian River Lagoon. Banana River Drive, located on the eastern side of the Central Campus/Processing District, runs adjacent to the Indian River Lagoon and is proposed to be stabilized and elevated to protect the district from the increased threat of flooding (Project X).

Long-term benefits to water resources would also occur within the VAB District. Roadways at risk of erosion and flooding from sea-level rise would be elevated to prevent degradation and to ensure spaceport operations are not affected in the future (Project F). Another proposed project within this district is to implement critical facility flood fortification (Project J) by retrofitting existing buildings or building replacements to protect critical facilities against future flood effects. Historically, the western portion of Banana Creek connected to the Indian River, and the eastern portion connected to the Banana River. With the construction of the Crawlerway, the connection between Banana River and Banana Creek was removed. Presently, the Indian River is connected to Banana Creek at the western end and the waters of Banana Creek continue under the SR3 Bridge to the eastern terminus at the Crawlerway. If a future hydrologic reconnection were to be undertaken, it would likely be where the VAB and Exploration Districts meet. Completing Project Q within the VAB District would restore this connection which would improve the health and quality of the Indian River Lagoon.

Within the Exploration Launch District, there are several projects with long-term beneficial effects. The health of the Indian River Lagoon would be improved by upgrading stormwater treatment infrastructure within this district under Project E. This project includes culvert restorations and drainage system improvements that would reduce road flooding and improve treatment before discharge. Philips Parkway is used to transport payloads at KSC but is subject to flooding and washouts. To ensure spaceport operations are not affected from sea-level rise, Phillips Parkway, Titusville Beach Access Road, and LC-39-B Bypass Road would be elevated and improved, and drainage system improvements would be constructed under Project J. Projects associated with the Proposed Action would improve water resources at KSC while mitigating the threat of sea-level rise on critical infrastructure needed to ensure efficient operations in the future. As KSC transitions into a multi-user spaceport, implementing the Proposed Action within this PEA would provide long-term benefits to water resources.

Once specific details of each proposed project are known, a re-evaluation of potential site-specific effects on water resources would be completed using the KSC Environmental Checklist and additional analysis would be conducted as warranted.

3.3.3.2 No Action Alternative

Under the No Action Alternative, KSC would not implement the ADPs. Minor, long-term effects to water resources from continued use of aging and energy inefficient infrastructure would be anticipated. There would be no change to coastal zone resources in and around KSC.

3.3.3.3 Other Reasonably Foreseeable Effects

Reasonably foreseeable effects to water resources from potential development in the Project Area are discussed in **Table 3.3-1.**

Table 3.3-1. Reasonably Foreseeable Environmental Effects to Water Resources

Reasonably Foreseeable Projects	***Geographic Overlap***	***Reasonably Foreseeable Effects***
Final EA and FONSI for the Replacement of the Administrative Building Complex and Construction of the Next Big Thing Experience at KSC, April 2024	Located within KSC / Not located within Project Area	The projects included in this section have the potential to degrade the quality of water resources located in and around KSC. Activities associated with the Proposed Action would be conducted in accordance with necessary permits for stormwater, pollutant discharge elimination systems, wastewater discharge, and potable water. Minimal adverse effects are expected during the construction phase of the Proposed Actions. Necessary project-specific documents would be developed, such as a Stormwater Pollution Prevention Plan (SWPPP), whenever necessary to mitigate erosion and turbidity of water resources in and around KSC. In following necessary permitting guidelines, cumulative effects to water resources at KSC are not expected to occur as a result of implementing the Proposed Action.
EA for the Construction of a New Retail Warehouse at KSC, December 2023		
EA for Exploration Park North at KSC, August 2021		
KSC REC 12714 for Blue Origin Manufacturing Complex Site Improvements, February 2024		
KSC REC 12670 for Airbus US Space and Defense site development and building expansion, January 2024		
KSC REC 12535 for the development of a railhead on KSC property, November 2023		

Table 3.3-1. Reasonably Foreseeable Environmental Effects to Water Resources		
Reasonably Foreseeable Projects	***Geographic Overlap***	***Reasonably Foreseeable Effects***
KSC REC 12900 for New Space Prep Spacecraft Processing Center / KSC Complex, July 2024	Located entirely within Project Area	Activities associated with this project include the construction of three buildings on approximately 92 acres at KSC. To avoid effects to water resources, KSC would construct the proposed facilities in accordance with permits and BMPs for erosion and sediment control, stormwater management, wetland and surface water protection, pollutant discharge elimination systems, and industrial wastewater discharge. These permits and BMPs will be followed during construction activities and monitored once complete to ensure water resource integrity is being upheld. Implementation of the Proposed Action is expected to have minimal cumulative effects on water resources at KSC when following the permitting regulations and implementing BMPs.
Final Supplemental EA (SEA) and FONSI for the Roberts Road SpaceX Operations Area Expansion and Supporting Infrastructure on KSC, April 2024	Partially located inside Project Area / Entirely located within KSC	This project includes developing approximately 100 acres with infrastructure to support SpaceX operations including, but not limited to, office space, industrial facilities to support mission success, storage, and manufacturing. Existing utilities would be upgraded, and Saturn Causeway would be widened. The activities associated with this project can affect water resources at KSC by altering preexisting hydrology through an increase in impervious surfaces, sedimentation and erosion in areas undergoing construction activities, and changes in stormwater runoff. Construction and operational activities would be conducted in accordance with permitting regulations while following BMPs to mitigate potential negative effects to water resources. Therefore, cumulative effects to water resources at KSC are not expected to occur through the implementation of the Proposed Action.

Legend: BMP = Best Management Practice; EA = Environmental Assessment; FONSI = Finding of No Significant Impact; KSC = Kennedy Space Center; REC = Record of Environmental Consideration; SOP = Standard Operating Procedure.

3.4 CULTURAL RESOURCES

3.4.1 Definition of the Resource

Cultural resources consist of buildings, districts, sites, structures, objects, artifacts, records, or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. Cultural resources can be divided into four major categories: archaeological resources (pre-contact and post-contact), architectural resources, traditional cultural places (TCPs), and sacred sites.

Archaeological resources are locations where human activity measurably altered the earth or left deposits of physical remains (e.g., tools, projectile points, or bottles). “Pre-Contact” refers to resources that predate the arrival of Europeans in a region. These resources can range from a scatter composed of a few artifacts to village sites and rock art. “Post-Contact” refers to resources that postdate the arrival of Europeans in a

region. Archaeological resources can include campsites, roads, fences, trails, dumps, battlegrounds, mines, and a variety of other features.

Architectural resources include standing buildings, dams, canals, bridges, and other structures of historic or aesthetic significance.

A traditional cultural place (TCP) is a building, structure, object, site, or district that may be listed or eligible for listing in the NRHP for its significance to a living community because of its association with cultural beliefs, customs, or practices that are rooted in the community's history and that are important in maintaining the community's cultural identity (National Park Service, 2024). TCPs may include landscape or geographic features, archaeological sites, buildings, neighborhoods, habitats, plants, animals, and minerals that American Indians or other groups consider essential for the continuance of traditional cultures.

Sacred sites are "any specific, discrete, narrowly delineated location that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion, provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site" (EO 13007).

Only cultural resources considered to be significant, known or unknown, warrant consideration with regard to adverse effects resulting from a Proposed Action. To be considered significant, archaeological or architectural resources must meet one or more criteria as defined in 36 CFR 60.4 for inclusion in the NRHP, and TCPs must also meet the criteria in 36 CFR Part 60.4. The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

a) that are associated with events that have made a significant contribution to the broad patterns of our history; or
b) that are associated with the lives of persons significant in our past; or
c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
d) that have yielded, or may be likely to yield, information important in prehistory or history.

In general, cultural resources must be more than 50 years old to be considered under existing cultural resources laws. However, more recent buildings and structures, such as Cold War-era military buildings, may warrant consideration if they have exceptional characteristics and the potential to be historically significant or if they are integral parts of a district that is eligible for the National Register of Historic Places (NRHP). These properties are evaluated under NRHP Criteria Consideration G, which includes properties that have achieved significance within the past 50 years.

Under Section 106 of the NHPA, federal agencies must take into account the effect of their undertakings on historic properties, consult with the State Historic Preservation Officer (SHPO) and other consulting parties, and allow the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment. The federal agency identifies and evaluates the NRHP eligibility of resources within the proposed undertaking's Area of Potential Effects (APE) and assesses the possible effects of the proposed undertaking on historic properties in consultation with the SHPO and other parties.

The APE is defined as the geographic area(s) "within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist." The APE for this project encompasses the areas where ground-disturbing activities, including new construction, building renovations and modifications, and building demolitions would occur. KSC has provided the FL SHPO with an opportunity to review and comment on the Proposed Action Alternative.

Several federal laws and regulations address cultural resources, including the NHPA (1966), the Archaeological and Historic Preservation Act (1974), the American Indian Religious Freedom Act (1978), the Archaeological Resources Protection Act (1979), and the Native American Graves Protection and Repatriation Act (1990).

3.4.2 Existing Conditions

Since 1949, the United States military had been performing launch operations at Cape Canaveral. In 1958, the Department of Defense transferred personnel and the Missile Firing Laboratory to NASA to become the Launch Operations Directorate under NASA's Marshall Space Flight Center at Cape Canaveral. Several Army facilities, offices, and hangars at Cape Canaveral Air Force Station (CCAFS) were given to KSC (CCAFS was renamed CCSFS in December 2020). After President John F. Kennedy began the Man-to-the-Moon project, CCAFS land was insufficient to support further expansion. New land was acquired in undeveloped areas west and north of Cape Canaveral to create the Merritt Island Launch Area in 1962 (NASA KSC, 2024h). Additional land acquisitions were purchased through 1963. A more detailed history of KSC is provided in the 2024-2029 Integrated Cultural Resources Management Plan (ICRMP) (NEMCON, 2024).

KSC maintains an ICRMP to aid in management of cultural resources on the installation in accordance with appropriate federal laws and other applicable regulations (NEMCON, 2024). The ICRMP is a five-year planning and management tool that outlines installation policies and procedures for the protection, management, and preservation of cultural resources, including historic properties, and for integrating cultural resources management into the overall planning process.

3.4.2.1 Archaeological Resources

KSC's landholdings have undergone a series of archaeological investigations since the late 1800s. A Center-wide archaeological survey was conducted between 1990 and 1996 to formulate a predictive model which identified archaeological potential for both pre-contact and post-contact archaeological sites. This predictive model has been used for planning purposes. These studies, as well as subsequent archaeological surveys focusing primarily on small parcels of land proposed for facility development, recorded a number of archaeological sites. This includes over 39 archaeological sites within KSC's operational area, including four that are eligible for the NRHP, 11 that have not been evaluated for the NRHP, and 24 that were determined not eligible for the NRHP. Approximately half of these sites are located within the larger planning district boundaries. Additionally, there are over 360 sites recorded within the entirety of KSC's and Cape Canaveral's landholdings.

In September and October 2023, KSC surveyed the SGBs within the larger Central Campus/Processing District, the VAB District, and the Exploration Launch District that were not previously subject to systematic survey (SWCA Environmental Consultants, 2024). This did not include lands within the former fire training area or the tract of land at the end of Robert H. Goddard Road. This survey, combined with previous surveys, did not identify any archaeological sites that are eligible for the NRHP. The conclusion of the survey was that no archaeological sites eligible for the NRHP are present in these SGBs

and these areas have a low probability of containing undisturbed archaeological sites due to severe disturbance and very poorly drained soils (SWCA Environmental Consultants, 2024). KSC found that no further archaeological investigations are warranted within the surveyed areas. KSC concluded consultation with the FL SHPO and federally recognized Tribal Nations in May 2024.

3.4.2.2 Architectural Resources

As of July 2025, KSC manages approximately 83 historic buildings, structures, or objects, and seven historic districts. The historic districts consist of LC-39 Pad A Historic District, LC-39 Pad B Historic District, SLF Area Historic District, Orbiter Processing Historic District, NASA-owned CCAFS Industrial Area Historic District, KSC Railroad System Historic District, and Solid Rocket Booster (SRB) Disassembly and Refurbishment Complex Historic District.

The Central Campus/Processing District contains some of NASA's most historically significant buildings, which were constructed early in KSC's history by renowned architect Charles Luckman. One such facility is the O and C Building, which was built in 1964 to support payload processing for the Apollo and Gemini missions. It was added to the NRHP in 2000 and is the district's only NRHP-listed resource. There are four NRHP-eligible resources in the Central Campus/Processing District: the Space Station Processing Facility (SSPF), the Ammonia Vapor Containment Building, the Engineering Development Lab, and the Launch Abort System Facility. The Roy D. Bridges Bridge (formerly the Banana River Bridge), which leads from this district to CCSFS, is eligible for listing in the NRHP due to its role in carrying payloads and rockets for the Apollo, Space Shuttle, and International Space Station (ISS) programs (NASA KSC, 2024a).

The Exploration Launch District contains two NRHP-listed historic districts: LC-39 Pad A Historic District and LC-39 Pad B Historic District. These districts hold immense cultural significance due to their association with the Apollo program. LC-39 Pad A Historic District consists of 22 contributing resources and one resource that is NRHP-listed. The LC-39 Pad B Historic District includes 20 contributing resources and one resource that is NRHP-listed. Presently, SpaceX has leased all the buildings within the LC-39 Pad A Historic District. In addition to the historic districts, there is one NRHP-eligible resource: the Astronaut Beach House. This is a two-story home built in 1962 that NASA acquired in 1963. Originally called the Astronaut Training and Rehabilitation Center, it served as a place for space crews to rest during overnight stays, and over time it evolved into a social gathering spot (NASA KSC, 2024b).

The VAB District has a collection of historically significant resources and is culturally significant as a place of innovation, where rockets and other vital technologies are crafted and brought to life. There are six NRHP-listed resources in the district: the VAB, the VAB Utility Annex, the Launch Control Center, the Crawlerway, the Crawler Transporters, and the Press Site: Clock and Flagpole. The Crawlerway is a crushed-rock pathway on which rockets are transported from the VAB to the launch pads, and the pair of Crawler Transporters are tracked vehicles that carry the rockets along the Crawlerway (NASA KSC, 2024c). The Press Site is a historic site associated with launches in the memories of generations of avid viewers worldwide who have watched the countdown clock and flagpole on television since the Apollo era. The original clock is now on display at the KSC Visitor Center. There are also four NRHP-eligible resources in the district: the Barge Terminal Facility, the Rotation/Processing Facility, the Mobile Launcher Platform 1, and the Manufacturing Building/Booster Fabrication Building. There are two NRHP-listed historic districts within the VAB District: the Orbiter Processing Historic District and the NASA KSC Railroad System Historic District. The Orbiter Processing Historic District includes three NRHP-eligible structures: the Orbiter Processing Facility, its High Bay 3, and the Thermal Protection

System Facility. The Railroad Historic District contains the railroad tracks entering KSC from across the Jay-Jay Bridge, which encircle the VAB and run south through the district to the Manufacturing Building/Booster Fabrication Building. The railroad tracks, Jay-Jay Bridge, and one 70-ton aft skirt car are eligible for listing in the NRHP.

3.4.2.3 Traditional Cultural Places

No known TCPs or Native American sacred sites have been identified at KSC (NEMCON, 2024). KSC consults with four federally recognized Tribal Nations that are historically and culturally affiliated with the area: the Miccosukee Tribe of Indians of Florida, Seminole Tribe of Florida, the Seminole Nation of Oklahoma, and the Thlopthlocco Tribal Town.

3.4.3 Environmental Consequences

Cultural resources are subject to review under federal laws and regulations. Section 106 of the NHPA requires KSC to consider the effects of its federally initiated, licensed, or permitted projects on cultural sites listed or eligible for inclusion in the NRHP. Once cultural resources have been identified, they are evaluated using the significance criteria established by the NPS. Only cultural resources determined to be significant (i.e., listed or eligible for listing in the NRHP) are given further consideration under the NHPA. KSC's Section 106 activities are governed by a Programmatic Agreement, with further instruction provided in the ICRMP.

Actions that have the potential to effect significant cultural resources include the following: 1) physically altering, damaging, or destroying all or part of a resource; 2) altering characteristics of the surrounding environment that contribute to resource significance; 3) introducing visual, audible, or atmospheric elements that are out of character with the property or alter its setting; or 4) neglecting the resource to the extent that it deteriorates or is destroyed. Potential effects to cultural resources can be assessed by identifying the type and location of the Action Alternative and by determining the location of significant cultural resources that could be affected. This includes the potential for visual, audible (noise), or atmospheric changes due to project implementation. In the case of the Proposed Action, potential effects to cultural resources could result from ground-disturbing activities associated with construction or demolition and modification of significant structures.

3.4.3.1 Proposed Action

Construction Effects

Archaeological Resources

In total, there are currently 22 recorded archaeological sites within the three Planning Districts. The Central Campus/Processing District currently has seven recorded archaeological sites including one historic site that is of unknown NRHP eligibility; one unknown site type that is of unknown NRHP eligibility; and four pre-contact sites and one post-contact site that are ineligible for the NRHP. The VAB District currently has three recorded archaeological sites, including one pre-contact site that is of unknown NRHP eligibility; and one pre-contact and one post-contact site that are not eligible for the NRHP. The Exploration Launch District currently has 12 recorded archaeological sites including three pre-contact sites that are eligible for the NRHP; one post-contact site that is of unknown NRHP eligibility; and six pre-contact sites, one pre-contact/post-contact site, and one post-contact site that are not eligible for the NRHP. One of these sites was subject to Phase III mitigative excavation prior to development of the VIP Viewing Facility at Saturn V/Apollo facility.

The majority of the SGBs within the three districts have been subject to archaeological testing, and no archaeological sites considered eligible or potentially eligible for listing in the NRHP have been

identified. For areas that have not been subject to archaeological testing and proposed construction Project Areas that extend beyond the SGBs, the KSC Cultural Resources Manager (CRM) will evaluate a project's effects to cultural resources on a case-by-case basis. In accordance with the ICRMP Standard Operating Procedure (SOP) Number 1, Project Review for Undertakings, the KSC Environmental Management Branch (EMB) is notified early in the planning process and is responsible for ensuring that KSC is in compliance with federal regulations, including Section 106 of the NHPA.

It is not expected that unidentified archaeological resources would be found during implementation of the Proposed Action at KSC. However, in the event of an unanticipated discovery during ground-disturbing activities, ICRMP SOP Number 5, Inadvertent Discovery of Cultural Materials, would be followed. This SOP requires the Project Manager to cease work immediately, secure the area, ensure that all cultural items are left in place and that no further disturbance is permitted to occur. The Project Manager would report the discovery to the KSC CRM. The KSC CRM would then determine the significance of the resources; consult with the FL SHPO, Tribal Nations and other consulting parties; and resolve any adverse effects prior to the implementation of the Proposed Action. In the event that human remains are discovered, KSC would comply with Florida State Laws and NAGPRA.

Architectural Resources

Implementation of the Proposed Action includes facility construction, demolition, renovation, and infrastructure upgrades within the three planning districts. In the Central Campus/Processing District, implementation would include the demolition and replacement of the Roy D. Bridges Bridge (NRHP-eligible), renovation of the Operations and Checkout South Wing Labs (NRHP-listed), and divestment of the SSPF (NRHP-eligible), which may all have an adverse effect. Adverse effect would be resolved in accordance with the processes outlined in KSC's Programmatic Agreement governing Section 106 review and consultation.

In the Exploration Launch District, implementation of the Proposed Action would include infrastructure renovation and several new construction projects (no demolition projects are included within this district). Infrastructure repairs or renovations along the Crawlerway (NRHP-listed) may cause adverse effects. New construction within the LCs would cause adverse effects to the Historic Districts (NRHP-listed). There are no historic properties within the proposed Project Areas of the Proposed Action in the VAB District. Adverse effect would be resolved in accordance with the processes outlined in KSC's Programmatic Agreement governing Section 106 review and consultation.

Traditional Cultural Places and Tribal Consultation

No known TCPs or sacred sites have been identified at KSC. Government-to-government consultation between KSC and each federally recognized Tribal Nation who may have historic association with the KSC property would be initiated on a project-specific basis. No significant effects to TCPs and sacred sites are anticipated due to the implementation of the Proposed Action.

Implementation of the Proposed Action may result in adverse effects to significant historic properties. Once a project is approved, licensed, or permitted by KSC, KSC will ensure compliance with federal regulations and laws. Adverse effects would be resolved in accordance with the processes outlined in KSC's Programmatic Agreement governing Section 106 review and be done in consultation with the SHPO, Tribal Nations, and consulting parties as required.

Operational Effects

No operational effects to cultural resources are expected once the construction of the Proposed Action has been completed. The KSC CRM evaluates each undertaking to determine whether activities would result in effects on cultural resources. If it is determined that there is a potential for effects on cultural resources, KSC personnel would follow procedures established in the ICRMP (NEMCON, 2024). Overall, implementation of the Proposed Action would not result in significant effects to cultural resources from operations.

3.4.3.2 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to cultural resources. Therefore, no effects to cultural resources would occur with implementation of the No Action Alternative.

3.4.3.3 Other Reasonably Foreseeable Effects

Reasonably foreseeable effects to cultural resources from potential development in the Project Area are discussed in **Table 3.4-1**.

Table 3.4-1. Reasonably Foreseeable Environmental Effects to Cultural Resources

Reasonably Foreseeable Projects	*Geographic Overlap*	*Reasonably Foreseeable Effects*
Final EA and FONSI for the Replacement of the Administrative Building Complex and Construction of the Next Big Thing Experience at KSC, April 2024	Located within KSC / Not located within Project Area	The KSC CRM evaluates undertakings that may result in effects to cultural resources on a case-by-case basis. In accordance with the ICRMP SOP Number 1, *Project Review for New Undertakings*, the KSC EMB is to be notified early in the planning process and is responsible for ensuring that the installation is in compliance with federal and state regulations. The EMB then notifies the CRM for review and concurrence (NEMCON, 2024). No TCPs or sacred sites have been identified at KSC. The KSC CRM has determined that these projects do not result in any adverse effects to significant cultural resources, if they are present. Therefore, there will be no cumulative effects to cultural resources.
EA for the Construction of a New Retail Warehouse at KSC, December 2023		
EA for Exploration Park North at KSC, August 2021		
KSC REC 12714 for Blue Origin Manufacturing Complex Site Improvements, February 2024		
KSC REC 12670 for Airbus US Space and Defense site development and building expansion, January 2024		
KSC REC 12535 for the development of a railhead on KSC property, November 2023		

Table 3.4-1. Reasonably Foreseeable Environmental Effects to Cultural Resources		
Reasonably Foreseeable Projects	***Geographic Overlap***	***Reasonably Foreseeable Effects***
KSC REC 12900 for New Space Prep Spacecraft Processing Center / KSC Complex, July 2024	Located entirely within Project Area	The KSC CRM evaluates undertakings that may result in effects to cultural resources on a case-by-case basis. In accordance with the ICRMP SOP Number 1, *Project Review for New Undertakings*, the KSC EMB is to be notified early in the planning process and is responsible for ensuring that the installation is in compliance with federal and state regulations. The EMB then notifies the CRM for review and concurrence (NEMCON, 2024). No TCPs or sacred sites have been identified at KSC. The KSC CRM has determined that these projects do not result in any adverse effects to significant cultural resources, if they are present. Therefore, there will be no cumulative effects to cultural resources.
Final Supplemental EA (SEA) and FONSI for the Roberts Road SpaceX Operations Area Expansion and Supporting Infrastructure on KSC, April 2024	Partially located inside Project Area / Entirely located within KSC	The KSC CRM evaluates undertakings that may result in effects to cultural resources on a case-by-case basis. In accordance with the ICRMP SOP Number 1, *Project Review for New Undertakings*, the KSC EMB is to be notified early in the planning process and is responsible for ensuring that the installation is in compliance with federal and state regulations. The EMB then notifies the CRM for review and concurrence (NEMCON, 2024).No TCPs or sacred sites have been identified at KSC. The KSC CRM has determined that these projects do not result in any adverse effects to significant cultural resources, if they are present. Therefore, there will be no cumulative effects to cultural resources.

Source: NEMCON, 2024
Legend: BMP = Best Management Practice; CRM = Cultural Resources Manager; EA = Environmental Assessment; EMB = Environmental Management Branch; FONSI = Finding of No Significant Impact; ICRMP = Integrated Cultural Resources Management Plan; KSC = Kennedy Space Center; REC = Record of Environmental Consideration, SOP = Standard Operating Procedure; TCP = traditional cultural place.

3.5 HAZARDOUS MATERIALS AND WASTES

3.5.1 Definition of the Resource

Hazardous materials are defined by 49 CFR Part 171.8 as "hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials, materials designated as hazardous in the Hazardous Materials Table (49 CFR 172.101), and materials that meet the defining criteria for hazard classes and divisions" in 49 CFR Part 173.

Hazardous wastes are defined by the RCRA in 42 U.S.C. Section 6903(5), as amended by the Hazardous and Solid Waste Amendments, as: "a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may (A) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible,

illness; or (B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed."

Special hazards include asbestos-containing materials (ACMs), polychlorinated biphenyls (PCBs), and lead-based paint (LBP). USEPA is given authority to regulate these special hazard substances by the Toxic Substances Control Act (TSCA) Title 15 U.S.C. Chapter 53. USEPA has established regulations regarding asbestos abatement and worker safety under 40 CFR Part 763 with additional regulation concerning emissions (40 CFR Part 61). FDEP regulates ACM disposal under FAC 62-257. Whether from lead abatement or other activities, depending on the quantity or concentration, the disposal of the LBP waste is regulated by the RCRA in 40 CFR Part 260. The disposal of PCBs is addressed in 40 CFR Parts 750 and 761.

3.5.2 Existing Conditions

3.5.2.1 Hazardous Materials and Wastes

KSC uses and stores various types of hazardous materials to support its mission, including fuels, paints, solvents, and other chemicals considered flammable, toxic, reactive, or explosive. In compliance with RCRA, KSC has a comprehensive program for managing, handling, and disposing of hazardous materials and wastes. These procedures are contained in Kennedy NASA Procedural Requirements (KNPR) 8500.1, Rev. E, *Kennedy Space Center Environmental Requirements* (NASA KSC, 2022b). KSC's Waste Management Office (WMO) directs and documents all actions relating to the handling, sampling, storage, transportation, treatment, disposal, and recovery of hazardous materials or wastes in accordance with all applicable federal, state, and local regulations.

KSC is currently operating as a USEPA Large Quantity Generator. The USEPA has largely delegated hazardous waste permitting to states. The FDEP manages permitting for the storage, treatment, and disposal of hazardous waste. Currently, KSC WMO manages KSC's three FDEP operating permits for the storage of hazardous waste: Hazardous Waste Storage Building, Solids (K7-0164); Hazardous Waste Storage Building, Liquids (K7-0165); and PCB Waste Storage Building (K7-0115). These buildings are located in the VAB District (NASA KSC, 2020c).

Transportation of hazardous waste is permitted by the FDOT which enforces federal hazardous waste transporter regulations (49 CFR 170-179). The KSC WMO maintains an inventory of transported wastes.

3.5.2.2 Hazardous Material Releases

Hazardous material releases to the environment are governed under the federal RCRA Corrective Action Program (CAP). The 1984 Hazardous and Solid Waste Amendments (HSWS) amendments to RCRA require corrective action for releases of hazardous waste from Solid Waste Management Units (SWMUs) at regulated facilities. At KSC, the CAP is jointly enforced by the USEPA and FDEP. The KSC EAB is responsible for notifying FDEP in the event of a release. Programs exist in various stages at KSC within each planning district to remediate soil and groundwater that contain contaminants, such as petroleum hydrocarbons, chlorinated solvents, heavy metals (such as arsenic and aluminum), PCBs, and per- and polyfluoroalkyl substances (PFAS). SWMUs and Potential Release Location (PRL) sites are required to be submitted on the hazardous and solid wastes portion of the RCRA facility permit.

In some cases, contamination may remain at a site with the implementation of Land Use Controls (LUCs). LUCs. LUCs may consist of physical barriers such as fences, pavement, security guards, or non-engineered instruments such as administrative or legal controls. Land Use Control Implementation Plans (LUCIPs) are developed for each LUC and periodic inspections and reporting ensure compliance with

these plans. Inspections are necessary to determine site conditions and provide agency notification to ensure the continued and future protection of human health and the environment. Inspection reports are submitted to USEPA and FDEP annually to certify compliance with the established controls. The KSC EAB currently manages 98 remediation sites with formal LUCIPs and nine sites with informal LUCIPs. Informal LUCIPs are developed for sites in the assessment, confirmatory sampling, or RCRA facility investigation phase. LUCIPs located within the Central Campus/Processing District, VAB District, or the Exploration Launch District (NASA KSC, 2024d) are depicted on **Figure 3.5-1**. See **Appendix D** for a summary of each LUCIP within the Project Area.

Although the terms and conditions of the Memorandum of Agreement (MOA) are not specifically incorporated or made enforceable within each LUCIP by reference, it is understood and agreed by KSC, USEPA, and FDEP that the contemplated permanence of the remedy reflected within each LUCIP shall be dependent upon KSC's substantial good faith compliance with the specific LUC maintenance commitments. Reasonable assurances would be provided to USEPA and FDEP as to the permanency of those remedies, which included the use of specific LUCs. Should such compliance not occur, or should the MOA be terminated, it is understood that the protectiveness of the remedy may be reconsidered and that additional measures may need to be taken to adequately ensure necessary future protection of human health and the environment. LUCIPs are generally prepared for sites undergoing some type of corrective action and would remain in place until the site conditions requiring LUCs are eliminated.

KSC is conducting ongoing Center-wide investigations for PFAS. PFAS has been identified in the soil, surface water, and groundwater. Laboratory analytical results are compared to USEPA Regional Screening Levels, USEPA Maximum Contaminant Levels, FDEP Provisional Soil and Groundwater Cleanup Target Levels, and/or the FDEP Surface Water Screening Levels. Information pertaining to the locations of elevated PFAS levels is maintained by the KSC EAB's Remediation Group. A total of 43 PFAS-contaminated sites has been identified throughout KSC, many of which correspond with areas that have existing formal LUCIPs in place. These sites have incorporated PFAS into their implementation plans. KSC has adopted the informal LUCIP process for the remaining sites with PFAS effects to ensure the protection of human health and the environment (NASA KSC, 2024d). **Figure 3.5-1** displays active Land Use Controls Areas. The information in **Figure 3.5-1** is current as of July 2024. Investigations are continuing and new information may come to light that changes this representation, and the KSC Remediation Program regularly provides updates about new data.

3.5.3 Environmental Consequences

Environmental effects would be considered adverse if hazardous materials, hazardous waste, or special hazards substantially increase the human health risk or environmental exposure through the storage, use, transportation, or disposal of these substances. For contaminated or remediation sites, effects would be adverse if the site were to be disturbed such that the extent and/or degree of contamination would increase.

3.5.3.1 Proposed Action

Construction Effects

As listed in **Tables 2.1-1** through **2.1-3**, several buildings would be demolished or renovated under the Proposed Action. Prior to demolition or renovation, all buildings would be evaluated for toxic substances including ACM, LBP, and PCBs; any hazardous materials would require mitigation (such as encapsulation and appropriate removal and disposal). Handling, transportation, or disposal of hazardous

building materials would be conducted in accordance with KNPR 8500.1E, as well as applicable local, state, and federal regulations.

New construction and certain renovation activities require the use of hazardous materials such as oil-based paints, welding gases, solvents, sealants, lubricants, and fuels. Any hazardous materials encountered, or hazardous wastes generated, would be properly stored and disposed of in accordance with KNPR 8500.1E, as well as the applicable state and federal requirements. The construction contractor would be required to characterize, containerize, label, manage while awaiting transfer, and ultimately transfer off-site for disposal at an appropriately licensed facility.

During construction, fuel may be temporarily stored in the construction staging areas for refueling operations. KSC operates a Spill Prevention Control and Countermeasures (SPCC) Plan, which provides generalized guidance for the proper handling and storage of fuels and other hazardous substances with a potential to affect the environment if released (NASA KSC, 2021). In addition, site-specific SPCC Plans are required to be developed that include the location and quantity of stored hazardous substances, potential spill routes, and measures for spill prevention and spill response. Site-specific SPCC Plans must be updated semi-annually.

Under the Proposed Action, several proposed projects involve potential ground-disturbing activities that are located in areas with LUCs. Any activities that may affect the effectiveness of the LUC, such as excavation or other construction that may disturb or encounter contaminated soil, groundwater, or surface water, require notification to the KSC EAB and approval by USEPA and FDEP. Any change to LUC management requires a modification of NASA's operating permit. Buildings constructed on or near a LUC site may be required to be designed with preventive measures, such as vapor intrusion barriers. Prior to approving dig permit reviews, design package reviews, consultations for construction design projects, and dewatering plan reviews, the KSC Remediation Group would consult the Environmental Checklist to determine whether further environmental evaluation is warranted. The Remediation Group must review any construction design packages that include a dewatering plan, including those in areas with PFAS present in groundwater, and be approved by FDEP (NASA KSC, 2024d).

KSC has existing measures to ensure all proposed construction, demolition, and renovation activities comply with applicable RCRA requirements for hazardous waste tracking and disposal, LUCIPs, SPCC Plans, and BMPs to minimize potential effects. The potential for adverse effects related to hazardous materials would be minimal and limited to the construction phase of the projects. When considering the design for each project, KSC would comply with the requirements set forth in each LUCIP. With continued compliance with the KNPR 8500.1E and LUCIPs, implementation of the Proposed Action would not result in significant effects from hazardous materials and wastes.

Operational Effects

Incidental hazardous material releases have the potential to occur from a variety of sources, including vehicles, material handling accidents, and off-site sources. However, procedures are currently in place for the proper use, storage, transportation, and disposal of hazardous materials, and the proper control and minimization of hazardous waste releases at KSC. Management of hazardous materials and hazardous wastes would not be affected as no substantial change in hazardous waste operations would be anticipated as a result of the Proposed Action.

Figure 3.5-1. KSC Land Use Control Areas

3.5.3.2 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur. KSC would continue to operate the buildings and infrastructure currently in use within the Central Campus/Processing District, Exploration Launch District, and VAB District. The use, storage, and disposal of hazardous materials and the generation of hazardous wastes would continue to be managed in accordance with existing KSC's hazardous waste management program as regulated by KNPR 8500.1D. LUC sites would be managed under existing LUCIPs, and ongoing investigations would be conducted in accordance with the informal LUCIPs and KNPR 8500.1D. Therefore, implementation of the No Action Alternative would not be significant for hazardous materials and wastes.

3.5.3.3 Other Reasonably Foreseeable Effects

Reasonably foreseeable effects to hazardous materials and waste from potential development in the Project Area are discussed in **Table 3.5-1**.

Table 3.5-1. Reasonably Foreseeable Environmental Effects to Hazardous Materials and Waste

Reasonably Foreseeable Projects	***Geographic Overlap***	***Reasonably Foreseeable Effects***
Final EA and FONSI for the Replacement of the Administrative Building Complex and Construction of the Next Big Thing Experience at KSC, April 2024	Located within KSC / Not located within Project Area	These projects could contribute to total use of hazardous materials and output of hazardous wastes associated with demolition and construction activities during the periods covered by these actions. For all projects, management of hazardous materials would be conducted in accordance with federal, state, and local regulations, and the KNPR 8500.1D, *Kennedy Space Center Environmental Requirements*. Therefore, implementation of the Proposed Action combined with the past, present, and reasonably foreseeable future projects would not result in significant effects to hazardous materials and wastes.
EA for the Construction of a New Retail Warehouse at KSC, December 2023		
EA for Exploration Park North at KSC, August 2021		
KSC REC 12714 for Blue Origin Manufacturing Complex Site Improvements, February 2024		
KSC REC 12670 for Airbus US Space and Defense site development and building expansion, January 2024		
KSC REC 12535 for the development of a railhead on KSC property, November 2023		

Table 3.5-1. Reasonably Foreseeable Environmental Effects to Hazardous Materials and Waste		
Reasonably Foreseeable Projects	***Geographic Overlap***	***Reasonably Foreseeable Effects***
KSC REC 12900 for New Space Prep Spacecraft Processing Center / KSC Complex, July 2024	Located entirely within Project Area	As stated above, this project could contribute to total use of hazardous materials and output of hazardous wastes associated with the construction proposed improvements. All hazardous material management would be conducted in accordance with KNPR 8500.1D and other applicable regulations. The proposed complex is located within the delineated boundaries of SWMU #s 041 and 055, located in the Vehicle Assembly Building District, and PRL # 237, which is Center-wide. The two SWMUs have formal LUCs with LUCIPs, and the PRL has an informal LUC in place. In compliance with KNPR 8500.1D, Chapter 22, KSC must ensure all activities which may encounter contaminated media are conducted in a manner that minimizes the potential to affect human health or the environment. With these policies in place, implementation of the Proposed Action combined with the proposed improvements under KSC REC 12900 would not result in cumulative effects to hazardous materials and wastes.
Final Supplemental EA (SEA) and FONSI for the Roberts Road SpaceX Operations Area Expansion and Supporting Infrastructure on KSC, April 2024	Partially located inside Project Area / Entirely located within KSC	This project could contribute to total use of hazardous materials and output of hazardous wastes associated with the proposed widening of Saturn Causeway. All hazardous material management would be conducted in accordance with KNPR 8500.1D and other applicable regulations. The potential for adverse effects related to hazardous materials and wastes would be minimal and limited to the construction phase of the project. Therefore, implementation of the Proposed Action combined with the Roberts Road expansion and Saturn Causeway widening would not result in cumulative effects to hazardous materials and wastes.

Legend: EA = Environmental Assessment; FONSI = Finding of No Significant Impact; LUC = Land Use Control; LUCIP = Land Use Control Implementation Plan; KSC = Kennedy Space Center; KNPR = Kennedy NASA Procedural Requirements; PRL = Potential Release Location; REC = Record of Environmental Consideration; SWMU = Solid Waste Management Unit.

3.6 LAND USE

3.6.1 Definition of the Resource

Land use is a way to describe the human use of land within a given area. Land use planning and zoning is crucial in ensuring compatible uses in adjacent land use zones and maintaining orderly growth within an area. As a federal agency, KSC is not subject to local zoning regulations and implements its own zoning and land use planning.

3.6.2 Existing Conditions

Land use planning at KSC currently provides mission support by implementing areas such as safety zones and clearances areas (NASA KSC, 2016). KSC contains over 141,000 acres and uses approximately 7,500

acres for support of missions and operations (NASA KSC, 2017b). For land not used for mission support, the USFWS and NPS maintain and operate the MINWR and CANA, respectively (NASA KSC, 2016).

KSC is divided into six planning districts. This PEA is focused on implementing ADPs within the Central Campus/Processing, VAB, and Exploration Launch Districts (**Figure 3.5-1**). Land use for each of the three districts is discussed in detail below.

The Central Campus/Processing District is one of the most active districts at KSC, and land use parcels in this district permit activities pertaining to light industrial, administrative, community, and open space. Parcels located in the eastern side of this district permit hazardous and heavy industrial activities (NASA KSC, 2024a).

Functions of the VAB District include processing facilities, launch control center, and the beginning portion of the Crawlerway (which once transported space shuttles into the Exploration Launch District). Land use in this district includes primarily heavy industrial, light industrial, and administrative, with parcels in the south and east supporting hazardous activities. Only one parcel permits open space and is located northeast of the VAB District (NASA KSC, 2024c).

The Exploration Lauch District contains some of the most critical infrastructure at KSC, including the primary launch pads of KSC, LC-39A and LC-39B. All parcels in this district permit launch, heavy industrial, and hazardous activities. Parcels 3 and 4, located in the southeastern portion of this district, permit landing activities (NASA KSC, 2024b).

3.6.3 Environmental Consequences

A land use effect could be considered significant if a Proposed Action is inconsistent with previous land use planning; is incompatible with adjacent land uses; threatens public health, safety, or property; and prevents future occupation of a given area.

3.6.3.1 Proposed Action

Construction Effects

Under the Proposed Action, construction, demolition, and renovation activities would occur within the Central Campus/Processing, Exploration Launch, and VAB Districts. Approximately 253 acres of land would be developed through these activities. Furthermore, 134.6 acres within the Central Campus/Processing District would accommodate future development within Parcels 1, 3, and 4 (see **Figure 2.1-4**).

The Central Campus/Processing district would designate 50 acres for green space (Project A) and redevelopment of the fire training area (Project W). Construction of the green space would not result in land use changes within the Central Campus/Processing District. Under the Proposed Action, the fire training area would be redeveloped as a hazardous form testing area due to the isolated nature of this area. Fire training would be relocated to another location. Redeveloping the fire training area would result in long-term changes to land use within the Central Campus/Processing District. (NASA KSC, 2024a).

The VAB District would develop 53 acres of land, including 20 acres for a new Payload Processing Facility (Project C), one acre to add C-5 substation capacity (Project E), five acres for the construction of an advanced exploration processing facility (Project O), two acres for expanded wharf support facilities (Project P), and 25 acres to connect the Banana River and Indian River Lagoon (Project Q). Changes to land use within the VAB District are not expected to occur for connecting the Banana River and Indian River Lagoon and adding C-5 substation capacity. Under the Proposed Action, long-term changes to land

use are expected for the construction of the Payload Processing Facility, advanced exploration processing facility, and expansion of wharf support facilities as the project footprints are located within previously undisturbed areas (NASA KSC, 2024c).

The Exploration Launch District would develop 150 acres of land with 130 acres developed for constructing a substation (Project M), LC-49 (Project N), LC-48 (Project F), small-class vehicle landing site (Project O), a future landing site (Project P), and 20 acres for scrub habitat mitigation strategies (Project B). Changes to land use are not expected to occur for wetland mitigation activities. Under the Proposed Action, long-term changes to land use are expected for the construction of a substation, LC-49, LC-48, small-class vehicle landing site, and the future land site as the project footprints are located within previously undisturbed areas (NASA KSC, 2024b).

No changes to land use are expected from new construction occurring primarily within the footprint of demolished buildings. Construction projects occurring on undeveloped land with various environmental constraints, such as wetlands and critical habitats, would result in long-term changes to land use under the Proposed Action. However, construction activities associated with the Proposed Action are expected to continue functions permitted within the respective parcels. Therefore, changes to land use under the Proposed Action are expected to be long-term and adverse, but not significant.

Operational Effects

Once construction activities associated with the Proposed Action are completed, operations would be similar to existing operations for new construction occurring primarily within the footprint of demolished buildings and operational benefits would be expected at KSC. Operations would be consolidated into more efficient facilities across a geographic area that is smaller than current conditions (NASA KSC, 2020a). For new operations occurring in previously undisturbed areas, operations would result in long-term changes to land use within those areas. However, land use would be consistent with allowable land use types within each district. KSC would follow all applicable protocols to mitigate effects from a change in land use.

As stated in Section 3.2, prescribed fires must be conducted in priority portions of KSC to maintain habitat for the federally listed Florida scrub-jay and Eastern indigo snake (NASA KSC, 2024g). The USFWS MINWR is the land manager for undeveloped lands throughout KSC. MINWR has divided KSC into numerous burn units with a goal of conducting prescribed fire in each unit on a 3-to-5-year rotation. Development and future facilities will accommodate the MINWR-prescribed fire program. Effects would be minimized by implementing BMPs to ensure only necessary land would be disturbed during operations.

Changes to existing land use at KSC are expected with the implementation of the Proposed Action. Operations within the designated parcels at each district are expected to remain compliant once construction activities are completed. Therefore, changes to land use under the Proposed Action are expected to be long-term and adverse, but not significant. Changes to land use under the Proposed Action will benefit KSC from the construction of more efficient facilities that can support increased operations as KSC transitions into a multi-user spaceport in the coming decades.

3.6.3.2 No Action Alternative

Under the No Action Alternative, NASA would not implement the KSC ADP. Land uses within the Central Campus/Processing District, VAB District, and Exploration Launch District would remain unchanged.

3.6.3.3 Other Reasonably Foreseeable Effects

Reasonably foreseeable effects to land use from potential development in the Project Area are discussed in **Table 3.6-1**.

Table 3.6-1 Reasonably Foreseeable Environmental Effects to Land Use

Reasonably Foreseeable Projects	***Geographic Overlap***	***Reasonably Foreseeable Effects***
Final EA and FONSI for the Replacement of the Administrative Building Complex and Construction of the Next Big Thing Experience at KSC, April 2024	Located within KSC / Not located within Project Area	These projects have the potential to cause changes in land use at KSC. New developments are needed to transform KSC into a multi-user spaceport capable of supporting various missions and the associated activities. All projects will adhere to land use planning outlined within the KSC CMP. The KSC CMP describes how developable land can be used and where activities associated with the Proposed Actions can occur. Following the KSC CMP will ensure compatible relationships between adjacent land uses, consolidate operations in a smaller geographic footprint, and the continued preservation of natural resources. Therefore, no changes in land use are expected to occur through the implementation of these projects.
EA for the Construction of a New Retail Warehouse at KSC, December 2023		
EA for Exploration Park North at KSC, August 2021		
KSC REC 12714 for Blue Origin Manufacturing Complex Site Improvements, February 2024		
KSC REC 12670 for Airbus US Space and Defense site development and building expansion, January 2024		
KSC REC 12535 for the development of a railhead on KSC property, November 2023		
KSC REC 12900 for New Space Prep Spacecraft Processing Center / KSC Complex, July 2024	Located entirely within Project Area	The proposed project will develop 20 acres in the southern end of the VAB District for the construction of a new Payload Processing Facility. This activity will occur within Parcel 27 of the VAB District, which designated heavy industrial and hazardous activities. Implementing the Proposed Action and constructing a multi-user Payload Processing Facility will cause no changes in land use and will adhere to current parcel functions.
Final Supplemental EA (SEA) and FONSI for the Roberts Road SpaceX Operations Area Expansion and Supporting Infrastructure on KSC, April 2024	Partially located inside Project Area / Entirely located within KSC	This project includes developing approximately 100 acres with infrastructure to support SpaceX operations, including, but not limited to, office space, industrial facilities to support mission success, storage, and manufacturing. Existing utilities will be upgraded, and Saturn Causeway will be widened. The activities associated with this project are expected to cause moderate effects to land use. A change in land use from operational buffer/conservation to launch operations and support will occur. This land is currently managed by the USFWS under the Merritt Island National Wildlife Refuge and would subsequently be transferred to SpaceX.

Legend: CMP = Center Master Plan; EA = Environmental Assessment; FONSI = Finding of No Significant Impact; KSC = Kennedy Space Center; REC = Record of Environmental Consideration; USFWS = United States Fish and Wildlife Service; VAB = Vehicle Assembly Building.

3.7 UTILITIES AND INFRASTRUCTURE

3.7.1 Definition of the Resource

This section discusses infrastructure such as utilities, including potable water; wastewater collection, treatment, and disposal; stormwater management; solid waste management; energy; and communications. Transportation systems and traffic are eliminated from detailed consideration at the beginning of Chapter 3: *Affected Environment and Environmental Consequences.*

3.7.2 Existing Conditions

The affected area for infrastructure and utilities includes Brevard County, Merritt Island, and KSC.

Potable Water

Potable water at KSC is sourced from the Taylor Creek Reservoir and groundwater wells located in east Orange County, treated at the Claude H. Dyal Water Treatment Plant. Various storage systems and secondary pump systems throughout KSC supply potable water where needed. Potable water at KSC is used for personnel uses, as well as commercial and industrial uses, including launch pad deluge sound suppression, pad washdown, and vehicle processing. KSC has a maximum daily usage of 2.2 million gallons. As of 2020, KSC uses an average of 0.58 million gallons per day (NASA KSC, 2020c).

Wastewater

KSC has two major collection points for domestic wastewater, one located in the Industrial Area and one in the VAB Area. KSC's domestic wastewater system provides service to approximately 90 percent of KSC. Additionally, there are currently approximately 40 on-site treatment and disposal systems (septic tanks) throughout KSC and MINWR to support facilities too distant for connections to the existing domestic wastewater system. KSC's domestic wastewater system transports wastewater to the CCSFS Regional Wastewater Treatment Facility (NASA KSC, 2020c).

Stormwater

KSC has 95 permitted surface water management systems that control stormwater runoff. Four large regional stormwater systems at KSC include the Region 1 system in the Industrial Area, the Sub-basin 11 system that serves the western VAB, the VAB South system that serves the south VAB, and the SLF system that serves the entire SLF area (NASA KSC, 2020c).

KSC manages an NPDES Stormwater permit for six industrial activities that include the Contractors Road Locomotive Yard; the SLF; the Ransom Road Reclamation Yard; the Transportation, Storage, and Disposal Facility; and the Visitors Center Fleet Maintenance Facility (NASA KSC, 2020c).

Solid Waste Management

Non-hazardous solid waste generated at KSC is disposed of on-site. KSC has two unlined Class III landfills, one operational and one closed, on Schwartz Road east of State Road 3. The two landfills are located between the Central Campus/Processing District and the VAB District. Construction and demolition debris are authorized to be disposed of within the landfills. Landfills at KSC are authorized under permits issued by the FDEP. It is the responsibility of the contractors to operate and maintain the landfills according to applicable regulations, permit requirements, and the John F. Kennedy Space Center/Schwartz Road Landfill, Class III Revised Landfill Operations Plan (EAP-REF-001). NASA EAB implements an inspection program to monitor landfill operations and ensure compliance with Solid Waste Management Facilities (FAC 62-701) and permit conditions (NASA KSC, 2022b).

Energy

KSC utilizes electricity and natural gas to meet energy requirements. In fiscal year 2019, KSC obtained 80 percent of utilized energy from electricity and 20 percent from natural gas. Electricity at KSC is supplied by Florida Power and Light. Two major 115 kV substations are located within the LC-39 and Industrial areas. KSC maintains and owns 13.2 and 13.8 kV distribution systems. In the event of service interruption, diesel generators and uninterruptable power supply units back up critical loads (NASA KSC, 2020c). Natural gas at KSC is supplied by Florida City Gas. The LC-39 area central utility plan produces heating/reheating high temperature hot water and distributes it to various buildings throughout KSC. In the event of service interruption, temporary mobile diesel boilers are utilized (NASA KSC, 2020c).

Communications

Voice and data communication services to KSC are provided by commercial providers via communication duct banks. Communications utility infrastructure within the Central Campus/Processing, VAB, and Exploration Launch Districts include underground distribution duct banks, cabling, termination fields, and cross connects. Furthermore, copper and fiber optic links are supported in the districts. The communications distribution network is primarily routed underground. To avoid possible disruptions to connectivity, distribution cabling would remain intact except in areas with buildings proposed to be demolished. Any inactive cabling would be identified and left in place with little to no effect on future maintenance costs (NASA KSC, 2024a).

3.7.3 Environmental Consequences

The effects analysis for infrastructure and utilities compares existing capacity and demand on a utility to a projected capacity and demand. Changes in facility usage or new facility construction may contribute to the total projected demand. A determination of significance is made when the projected increase in demand for a utility would exceed the planned capacity for that utility such that the utility provider would not be able to service additional demands while maintaining the same level of service for existing customers.

3.7.3.1 Proposed Action

Construction Effects

As listed in **Tables 2.1-1** through **2.1-3**, several energy inefficient buildings would be demolished, and the construction or renovation of Leadership in Energy and Environmental Design (LEED)-certified energy-efficient buildings would occur under the Proposed Action. Furthermore, projects under the Proposed Action would improve utilities and infrastructure within the Central Campus/Processing, Exploration Launch, and VAB District, including repairing and upgrading the sewage conveyance system; constructing a new communication distribution and switching center; stormwater improvements; upgrading stormwater treatment infrastructure; creating a Titusville beach utility corridor; constructing a new substation; adding C-5 substation capacity; and upgrading Saturn Causeway utilities.

During construction, demolition, renovation/sustainment projects, and utility and infrastructure upgrades, minor, short-term effects on potable water, wastewater, stormwater, solid waste management, energy, and communications at KSC are expected under the Proposed Action. Minor effects would occur from temporary service interruptions needed to connect new utilities to the existing utility lines or to complete repairs on existing utilities and infrastructure. However, the replacement and upgrades to aging utilities and infrastructure at KSC would increase the capacity to serve future demands as KSC transitions into a

multi-user spaceport and increases operational activities. Long-term energy and water savings would occur from the construction of LEED certified energy-efficient buildings. Therefore, the Proposed Action would have minor, short-term effects during construction activities. Once construction activities are completed, utility and infrastructure improvements would serve a long-term benefit to KSC.

Operational Effects

As KSC transitions into a multi-user spaceport, an increase in personnel loading and operations are expected to increase utility demands. Projects that are slated for development under the Proposed Action are expected to increase impervious surfaces, which would ultimately have long-term effects on stormwater infrastructure. The effects of individual projects are beyond the scope of this PEA and would require future NEPA analyses as projects are finalized. KSC will implement BMPs and LID practices whenever possible to mitigate the effects due to increased stormwater runoff. Therefore, operation of the Proposed Action would result in minor long-term effects to water resources. Long-term beneficial effects to utilities and infrastructure at KSC are expected under the Proposed Action from construction, renovation, and upgrades throughout the Central Campus/Processing, Exploration Launch, and VAB Districts.

3.7.3.2 No Action Alternative

Under the No Action Alternative, NASA would not implement the KSC ADP. Utilities and infrastructure within the Central Campus/Processing District, VAB District, and Exploration Launch District would not undergo construction of renovation projects. Utilities and infrastructure would continue to operate under current capacities and existing conditions. Long-term effects to utilities and infrastructure at KSC would be expected from continued use of aging and energy inefficient infrastructure at KSC.

3.7.3.3 Other Reasonably Foreseeable Effects

Reasonably foreseeable effects to utilities and infrastructure from potential development in the Project Area are discussed in **Table 3.7-1**.

Table 3.7-1. Reasonably Foreseeable Environmental Effects to Utilities and Infrastructure

Reasonably Foreseeable Projects	*Geographic Overlap*	*Reasonably Foreseeable Effects*
Final EA and FONSI for the Replacement of the Administrative Building Complex and Construction of the Next Big Thing Experience at KSC, April 2024	Located within KSC / Not located within Project Area	These projects have the potential to directly affect utilities and infrastructure at KSC. New developments are needed to transform KSC into a multi-user spaceport capable of supporting various missions and the associated activities. During this transformation, cumulative effects to utilities and infrastructure are expected. The capacity of utilities would be upgraded, as needed, to support new development at KSC. Temporary service disruptions may arise during utility and infrastructure construction and upgrades. KSC would coordinate any planned service disruptions to ensure there would be no significant adverse cumulative effects.
EA for the Construction of a New Retail Warehouse at KSC, December 2023		
EA for Exploration Park North at KSC, August 2021		
KSC REC 12714 for Blue Origin Manufacturing Complex Site Improvements, February 2024		
KSC REC 12670 for Airbus US Space and Defense site development and building expansion, January 2024		
KSC REC 12535 for the development of a railhead on KSC property, November 2023		

Table 3.7-1. Reasonably Foreseeable Environmental Effects to Utilities and Infrastructure

Reasonably Foreseeable Projects	*Geographic Overlap*	*Reasonably Foreseeable Effects*
KSC REC 12900 for New Space Prep Spacecraft Processing Center / KSC Complex, July 2024	Located entirely within Project Area	The proposed project will develop 20 acres in the southern end of the VAB District for the construction of a new Payload Processing Facility. Implementing the Proposed Action and constructing a multi-user Payload Processing Facility may cause cumulative effects to utilities and infrastructure. The capacity of utilities would be upgraded, as needed, to support the construction of the Payload Processing Facility. KSC would coordinate any planned service disruptions to ensure there would be no significant adverse cumulative effects.
Final Supplemental EA (SEA) and FONSI for the Roberts Road SpaceX Operations Area Expansion and Supporting Infrastructure on KSC, April 2024	Partially located inside Project Area / Entirely located within KSC	This project includes developing approximately 100 acres with infrastructure to support SpaceX operations, including, but not limited to, office space, industrial facilities to support mission success, storage, and manufacturing. Existing utilities within the vicinity of the Project Area will be upgraded. The activities associated with this project are expected to directly affect utilities and infrastructure at KSC. Temporary service disruptions may arise during utility and infrastructure construction and upgrades. KSC would coordinate any planned service disruptions to ensure there would be no significant adverse cumulative effects. This project would benefit utilities and infrastructure at KSC as aging utilities would be upgraded to support the SpaceX Operations area.

Legend: EA = Environmental Assessment; FONSI = Finding of No Significant Impact; KSC = Kennedy Space Center; REC = Record of Environmental Consideration; VAB = Vehicle Assembly Building.

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4.0 MITIGATION MEASURES

4.1 MITIGATION MEASURES

Mitigation measures and BMPs that would apply to the projects associated with the Proposed Action are summarized in **Table 4.1-1**.

Table 4.1-1. Best Management Practices and Mitigation Measures

Resource	Environmental Protection Measures
Air Quality	• Dust Suppression Management Controls. • Apply palliatives to abate dust generation. • Complete air emissions calculations to determine emission generation. • Long-term increased use in electric vehicles.
Biological Resources	• Follow practices stated in the Natural Resources Management Plan and Biological Opinions. • Implement Best Management Practices to prevent the spread of noxious weeds.
Water Resources	• Stormwater Pollution Prevention Plan (SWPPP). • Stormwater Construction Permits. • General and Site-Specific Spill Prevention, Control, and Countermeasures Plans. • Low Impact Development (LID) principles. • Green Infrastructure Practices to restore and maintain existing hydrology. • Clean Water Act National Pollutant Discharge Elimination System Program Permits. • Clean Water Act Section 404 permitting and compensatory mitigation, if warranted. • Sedimentation and Erosion Control Plan. • Follow statutes described in Florida's Coastal Zone Management Program.
Cultural Resources	• Follow practices stated in the KSC Integrated Cultural Resources Management Plan.
Hazardous Materials and Wastes	• Adhere to KSC Environmental Requirements (KNPR 8500.1, Rev. E) for the management of hazardous materials and wastes, spill prevention, and remediation. • Follow Land Use Control Implementation Plans (LUCIPs) and any guidance specified in RECs. • General and Site-Specific Spill Prevention, Control, and Countermeasures Plans. • Adherence to Occupational Safety and Health Act safety and health standards for safe and healthy workplaces.
Land Use	• Follow the Real Property Master Plan. • Implement Integrated Training Area Management Program. • Update the Installation Compatible Use Zone Study as needed. • Follow recommendations of Joint Land Use Study. • Implement Army Compatible Use Buffer program.
General Construction Practices	• Apply palliatives for dust suppression. • Follow Sedimentation and Erosion Control Plans and Best Management Practices. • Follow practices stated in the Integrated Natural Resources Management Plan. • Follow practices stated in the Integrated Wildland Fire Management Plan. • Follow practices stated in the Integrated Cultural Resources Management Plan. • Follow stormwater management plans. • Install landscaping post-construction.

Legend: KNPR =Kennedy NASA Procedural Requirements; KSC = Kennedy Space Center; REC = Record of Environmental Consideration.

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Author	Date	Title
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NASA KSC	2024d	Land Use Control Inspections Report 2023 for KSC.
NASA KSC	2024e	SC REC #12670, Airbus US Space & Defense, Inc. Phase B Expansion.
NASA KSC	2024f	KSC REC #12714, Blue Origin OLS Manufacturing Complex Site Improvements.
NASA KSC	2024g	Wildland Fire Discovery Paper for NASA KSC.
NASA KSC	2024h	Kennedy Space Center History. Accessed from: https://public.ksc.nasa.gov/partnerships/about-us/ksc-history/
NASA KSC	2025a	Final EA for the Schwartz Road Property at KSC.
NASA KSC	2025b	MOU Between Space Launch Delta 45, USFWS, and KSC John for Prescribed Burning on MINWR, KSC, CCSFS.
NASA KSC	2025c	Lauch Complex 39A Landing Zones
NEMCON	2024	Integrated Cultural Resources Management Plan for NASA KSC 2024-2029.
National Park Service (NPS)	2024	National Register Bulletin 38: Identifying, Evaluating, and Documenting Traditional Cultural Places.
Space Florida	2017	Cape Canaveral Spaceport Master Plan. January. Accessed from: https://www.spaceflorida.gov/florida-spaceport-improvement-program
SpaceX	2024	Final EA, Supplemental EA, and FONSI for the Roberts Road SpaceX Operations Area Expansion & Supporting Infrastructure on KSC.
SWCA Environmental Consultants	2024	An Archaeological Survey of the Kennedy Space Center Spaceport Growth Boundaries Districts 1, 2, 3, and 4, Brevard County, Florida.
Unified Facilities Criteria (UFC)	2023	Unified Facilities Criteria 3-210-10 Low Impact Development.
United States Environmental Protection Agency (USEPA)	1974	Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin on Safety, March.
USEPA	2024a	Air Quality Design Values. Accessed October 8, 2024 at: https://www.epa.gov/air-trends/air-quality-design-values
USEPA	2024b	Nonattainment/Maintenance Status for Each County by Year for All Criteria Pollutants. Accessed September 27, 2024 at: https://www3.epa.gov/airquality/greenbook/anayo_fl.html.
United States Fish and Wildlife Service (USFWS)	2008	Merritt Island National Wildlife Refuge Comprehensive Conservation Plan.

Author	Date	Title
USFWS	2010	NASA Environmental Protection Branch Biological Opinion. FWS Log Number 41910-2010-F-0285
USFWS	2013a	NASA Environmental Protection Branch Biological Opinion. FWS Log Number 41910-2013-F-0264
USFWS	2013b	NASA Environmental Protection Branch Biological Opinion. FWS Log Number 04EF1000-2013-F-0194.
USFWS	2024	Information for Planning and Consultation search for KSC. Accessed September 27, 2024 at: https://ipac.ecosphere.fws.gov
USFWS	2025	USFWS website on the Monarch butterfly (*Danaus Plexippus*) accessed July 10, 2025. https://www.fws.gov/species/monarch-danaus-plexippus
U.S. Space Force (USSF)	2022	Cape Canaveral Space Force Station District Development Plan. Space Launch Delta 45, Florida.
USSF	2024	Final Environmental Assessment and Finding of No Significant Impact for Eastern Range Planning and Infrastructure Development at Cape Canaveral Space Force Station. January. Accessed from https://www.patrick.spaceforce.mil/Resources/Environmental-Information: https://www.patrick.spaceforce.mil/Resources/Environmental/.

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Appendix A
Agency Scoping

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National Aeronautics and Space Administration

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

Reply to Attn of: SI-E3

April 1, 2025

Subject: Scoping for the National Aeronautics and Space Administration Kennedy Space Center Master Plan Programmatic Environmental Assessment

Dear Potential Stakeholder:

This letter is to notify you, as a potentially interested stakeholder, that the National Aeronautics and Space Administration (NASA) Kennedy Space Center (KSC) located in Brevard County, Florida, is preparing a Programmatic Environmental Assessment (PEA). The PEA is for proposed implementation of a Center Master Plan (CMP) to guide future development and investments at KSC. The PEA is being prepared to satisfy NASA's obligations under the National Environmental Policy Act and to ensure the Proposed Action complies with applicable federal statutes, including, but not limited to, the Endangered Species Act, Section 106 of the National Historic Preservation Act, and Coastal Zone Management Act.

Scoping

NASA requests and welcomes your input in identifying community interests, specific resources, and alternatives to analyze in the PEA. A virtual agency scoping meeting will be held on 23 April 2025 from 2:00 PM to 3:00 PM (EST).

Background

KSC is divided into six planning districts with each planning district having a defined growth boundary. The growth boundary identifies the limits of future development within the environmental and operational constraints and land use patterns of that district. NASA's Proposed Action is to implement a CMP through a phased approach which includes facility construction, demolition, renovation, infrastructure upgrades, and divestment/outgrants of buildings and/or land areas. The CMP would guide future activities and investments in three of the six planning districts through Area Development Plans (ADPs), a Parcel Opportunity Analysis (POA), and a Center Development Plan (CDP). The three planning districts include the Central Campus/Processing District, Exploration Launch District, and Vehicle Assembly Building District (see Enclosure 1). Implementation of the CMP would support and enhance KSC and its commercial partners with flexible processing and launch capabilities, robust infrastructure, and sustainable facilities over the next 20 years. The need for the Proposed Action is to support KSC's core capabilities to meet existing (i.e., short-term) and future (i.e., mid- to long-term) NASA and non-NASA operational mission requirements.

The ADPs include proposed projects developed during a stakeholder-driven planning process in consideration of NASA's Vision Plan (Enclosures 2-4). The POA identifies lands suitable for future development by commercial partners and includes three parcels (Parcel 1, Parcel 3, and Parcel 4) for analysis in the PEA (see Enclosure 5). The CDP focuses on strategies KSC should implement to support evolving NASA and commercial requirements, such as upgrading the existing Florida Power & Light transmission system from 115kv to 230kv, which would support

increased launch tempos (see Enclosure 6). The Proposed Action focuses on reducing real property assets and operating costs as KSC continues to evolve into a multi-user spaceport.

Your input and comment on the Proposed Action will be considered in the Draft PEA, which will be made available for public review and comment. Following the meeting, please send comments and inquiries to Mr. James T. Brooks by 7 May 2025 via e-mail at james.t.brooks-1@nasa.gov or via U.S. mail to the following address:

KSC Environmental Management Branch
ATTN: James T. Brooks
Kennedy Space Center, FL 32899

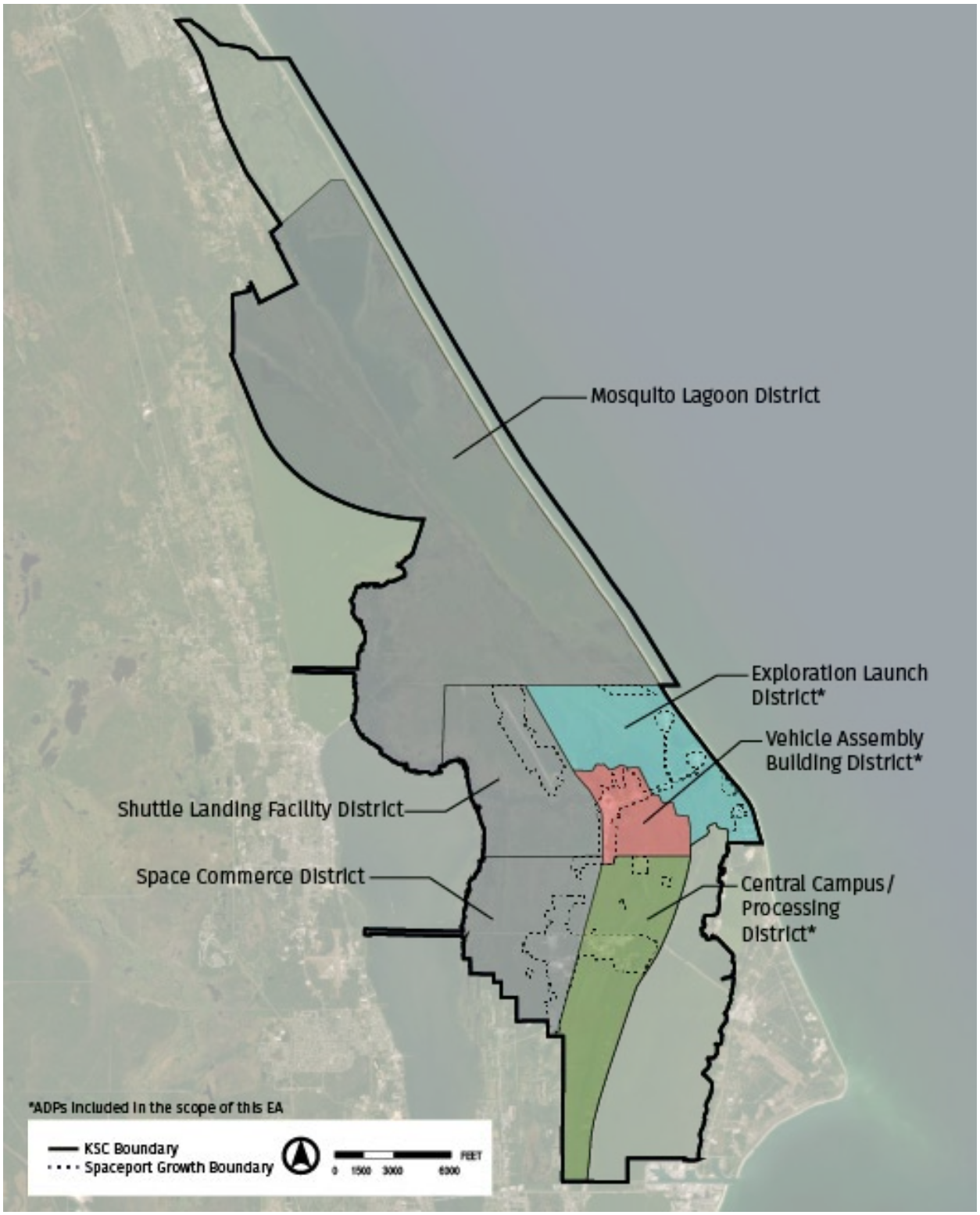
Sincerely,

James T. Brooks
Environmental Protection Specialist, National Environmental Policy Act Lead
Mail Code; SI-E3

List of Enclosures:

Enclosure 1: Map of Area Development Plan Project Areas
Enclosure 2: Proposed Projects in the Central Campus/Processing District
Enclosure 3: Proposed Projects in the Exploration Launch District
Enclosure 4: Proposed Projects in the Vehicle Assembly Building District
Enclosure 5: Potential Future Development Land Parcels
Enclosure 6: Potential Route of High Transmission Electrical Lines

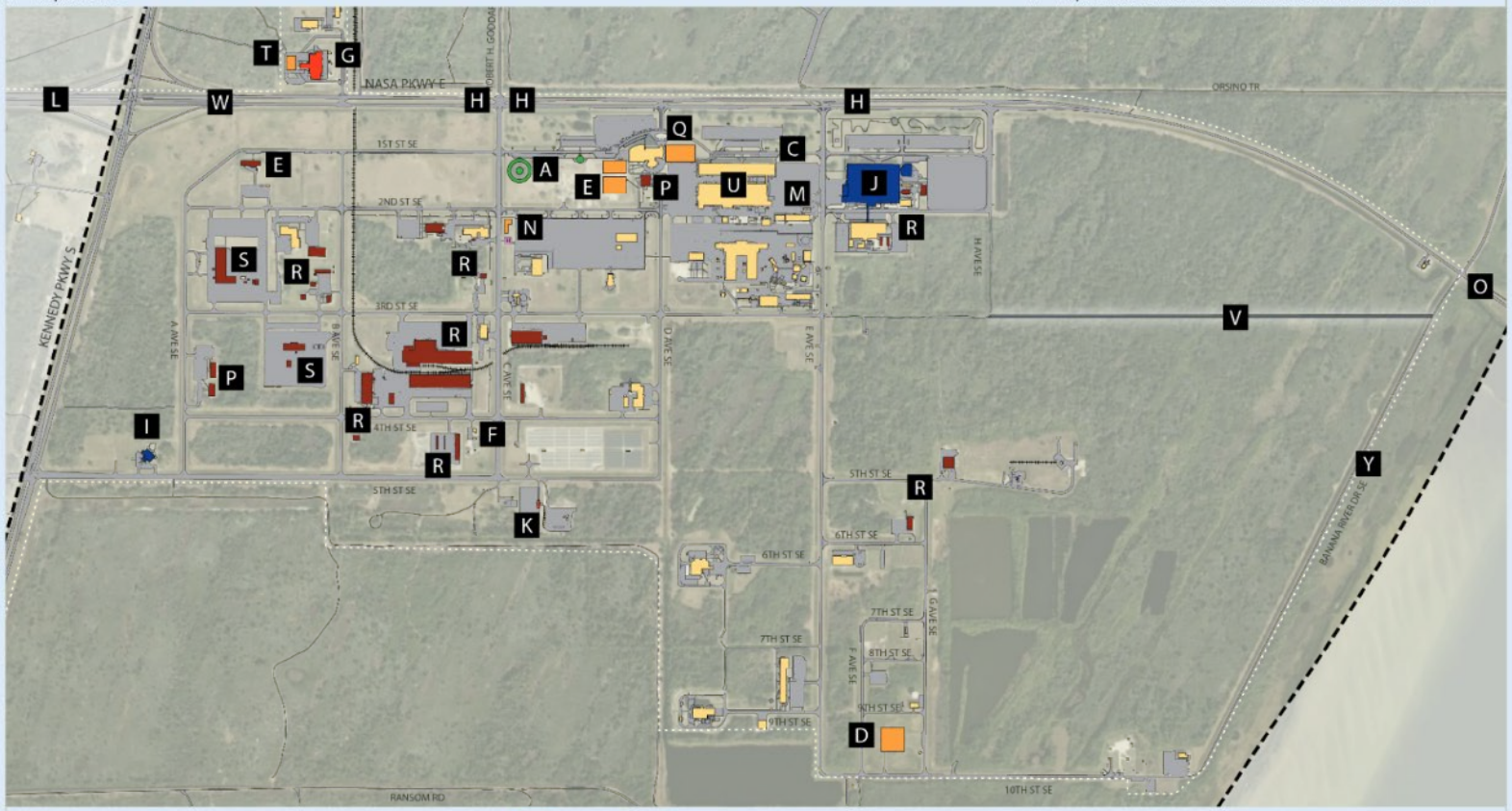
Enclosure 1: Map of Area Development Plan Project Areas



Enclosure 2: Proposed Projects in the Central Campus/Processing District

Projects

A. Construct Contemplative Green Spaces
B. Provide EV Charging Infrastructure throughout the District (not shown on map)
C. Implement Pedestrian Improvements
D. Construct Orion Clamshell
E. Construct Applied Science and Technical Analysis Facility
F. Repair/Upgrade Sewage Conveyance System
G. Renovate CD&SC
H. Implement Stormwater Improvements
I. Replace CDC
J. Outgrant/Divest/IOZ Space in SSPF
K. Upgrade Orsino Substation
L. Modernize and Upgrade Physical Security
M. Extend Chilled Water Loop
N. Construct Emergency Support Facility
O. Replace Roy D. Bridges Bridge
P. Demo Facilities Programmed for Central Campus HQ Phase 2 (see VAB District ADP)
Q. Construct Central Campus HQ Phase 2
R. Demo Facilities Programmed for Consolidated Warehouse Facility (see VAB District ADP)
S. Demo Facilities Programmed for Consolidated Maintenance Complex (see VAB District ADP)
T. Construct New CD&SC
U. Repurpose O&C South Wing Labs
V. Extend 3rd Street Southeast
W. (Commercial Capacity) Relocate NASA Gate
X. Redevelop Fire Training Area (not shown on map)
Y. Implement Banana River Drive Sea Level Rise Stabilization

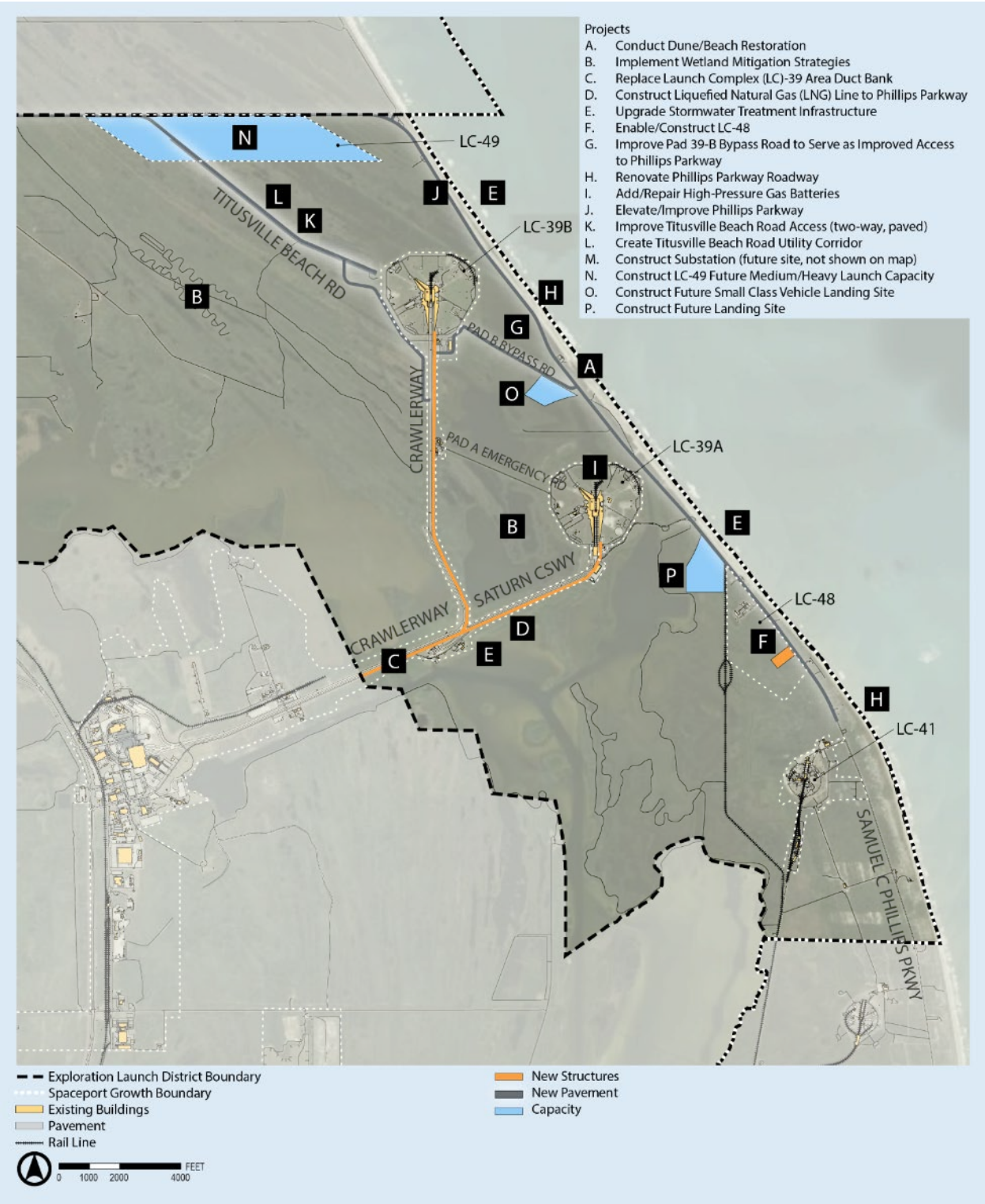


Central Campus/Processing District Boundary
Spaceport Growth Boundary
Existing Buildings
Pavement
Rail Line

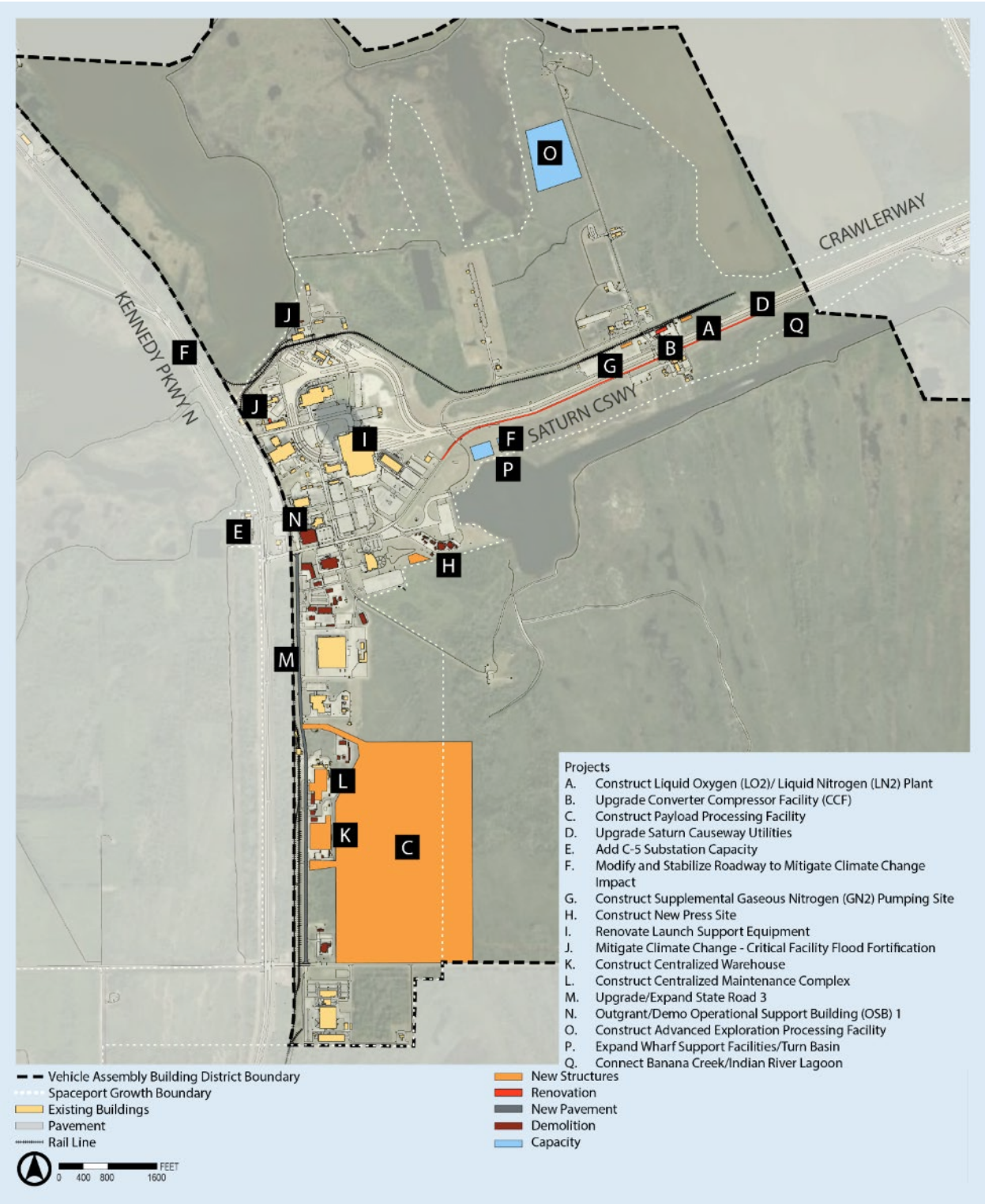
New Structures
Renovation
Demolition
Divest/Outgrant
New Green Space
New Pavement

0 500 1000 2000 FEET

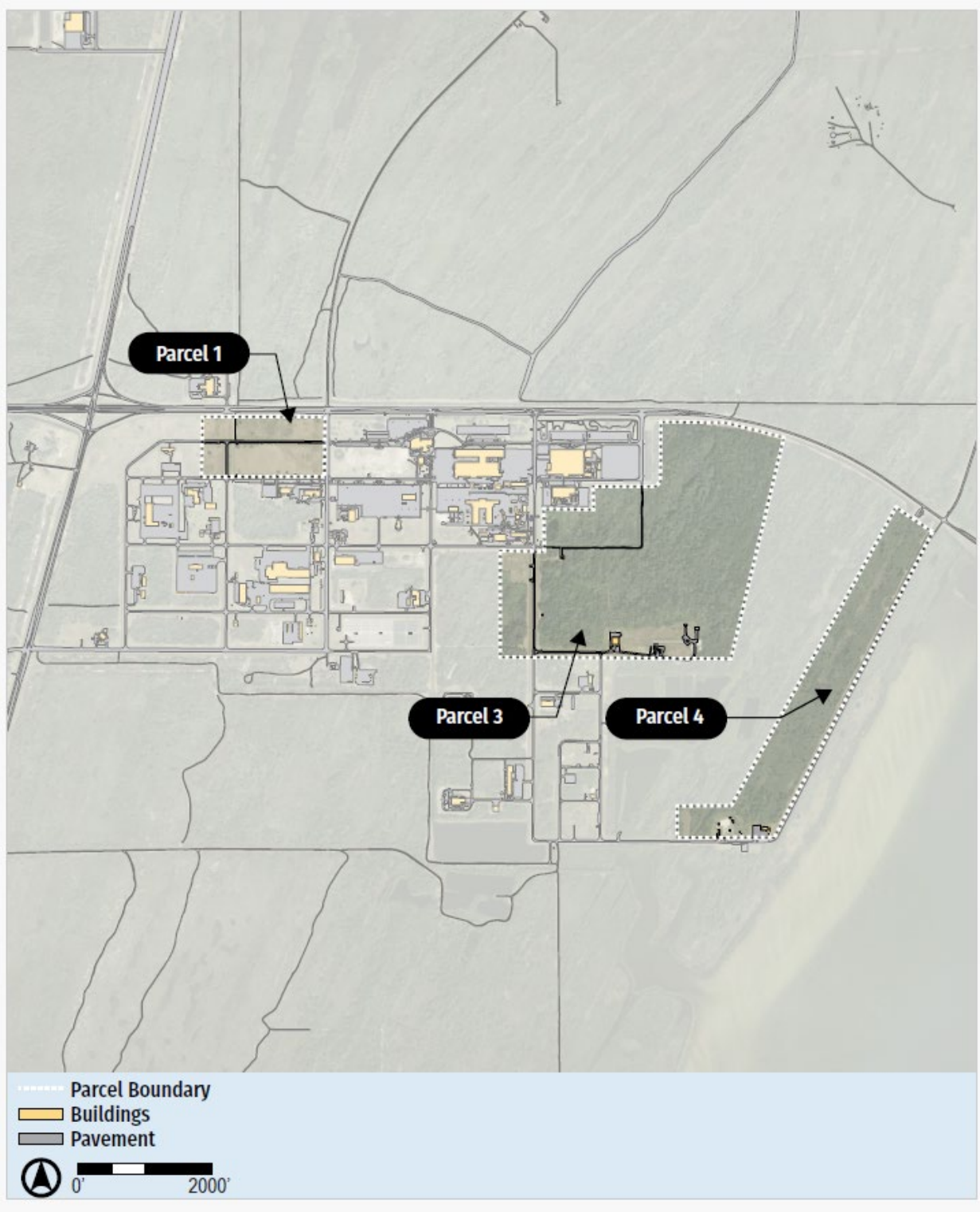
Enclosure 3: Proposed Projects in the Exploration Launch District



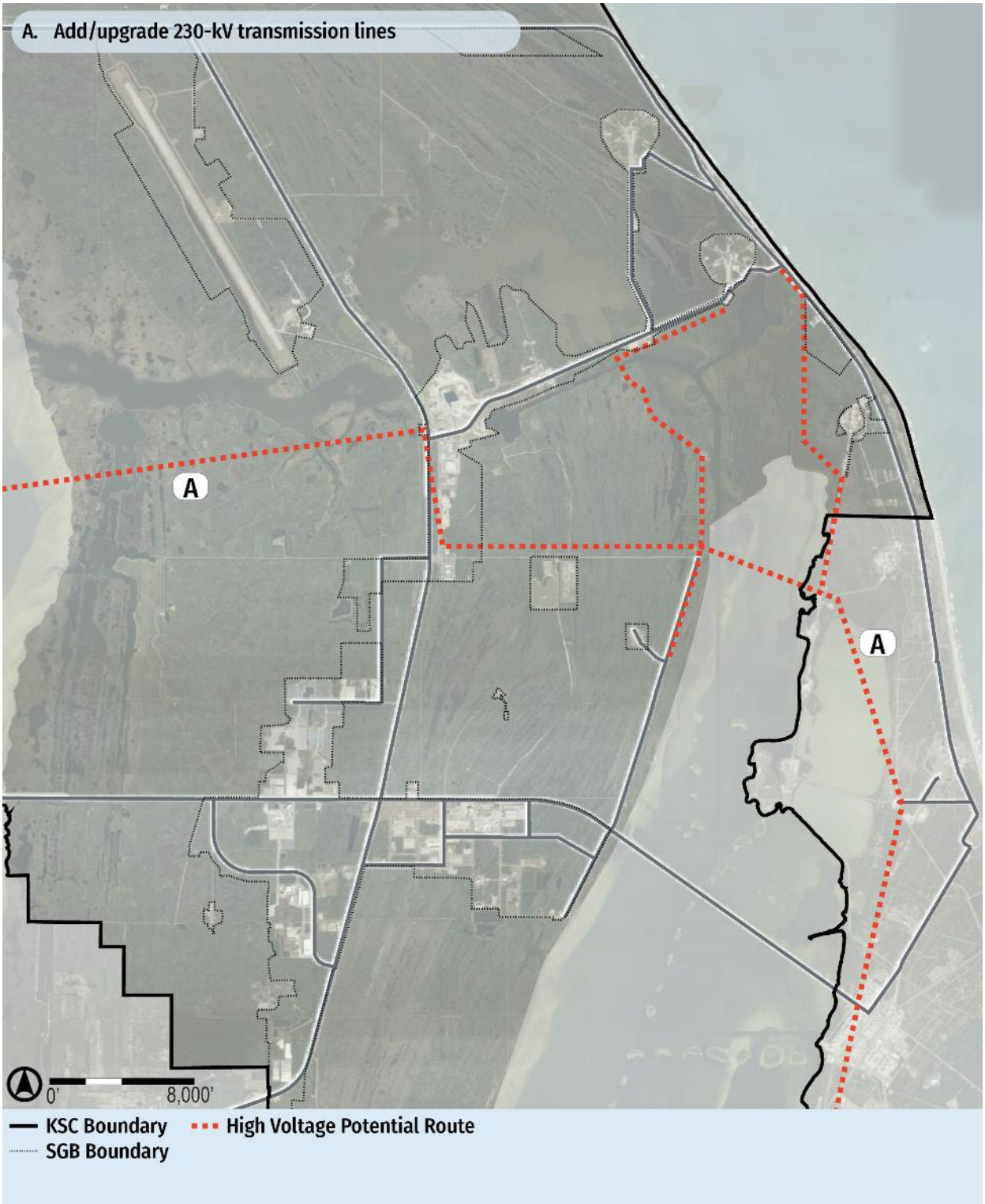
Enclosure 4: Proposed Projects in the Vehicle Assembly Building District



Enclosure 5: Potential Future Development Land Parcels



Enclosure 6: Potential Route of High Transmission Electrical Lines



NASA Kennedy Space Center Master Plan Programmatic Environmental Assessment

Background

NASA proposes to implement a Center Master Plan (CMP) that guides future development and investments at KSC. In accordance with the National Environmental Policy Act (NEPA), NASA is preparing the KSC CMP Programmatic Environmental Assessment (PEA) to evaluate the potential environmental effects of implementing a phased approach to facility construction, demolition, renovation, and infrastructure upgrades identified in Area Development Plans (ADPs) for the Exploration Launch District, VAB District, and Central Campus/Processing District, along with a Parcel Opportunity Analysis (POA) and Center Development Plan (CDP). The ADPs were developed in 2024 consistent with the goals and objectives identified in the 2020 Vision Plan, including the preservation of natural habitats and development within previously disturbed areas.

Purpose of the Proposed Action

The purpose of the Proposed Action is to enhance KSC's multi-user spaceport with flexible processing and launch capabilities, robust infrastructure, and sustainable facilities through the implementation of a phased approach to facility construction, demolition, and renovation; infrastructure upgrades; and divestments/outgrants.

Need for the Proposed Action

The need for the Proposed Action is to support KSC's core capabilities to meet existing (i.e., short-term) and future (i.e., mid- to long-term) NASA and non-NASA operational mission requirements over the next 20 years.

The Proposed Action

The Proposed Action would implement facility construction, demolition, renovation, infrastructure upgrades, and divestment/outgrants of buildings and/or land areas in a phased approach within the Central Campus/Processing, Exploration Launch, and Vehicle Assembly Building districts, as well as key projects identified in the POA and CDP. This includes any future development and any anticipated commercial development at KSC within those three districts. Project implementation phases would include short-term (0-5 years), mid-term (6-10 years), and long-term (11-20 years). The POA identifies land areas with high potential for future development. The CDP focuses on strategies that KSC should implement to support evolving NASA and commercial requirements.

The Proposed Action would add approximately 676,421 Gross Square Feet (GSF) of new construction; however, demolition of obsolete buildings and structures would remove approximately 1,910,117 GSF resulting in an overall reduction of 1,233,696 GSF at KSC.

Divestment of excess buildings in the Central Campus/ Processing District would remove approximately 67,225 GSF from KSC's real property inventory. Infrastructure improvements throughout the three districts would add a total of 123,011 Linear Feet (LF) and stormwater improvements would be implemented throughout KSC. Approximately 253 acres of land within the growth boundaries of the three districts would be developed for various projects.

FACT SHEET

For more information on the Proposed Action, please contact:

James T. Brooks, NEPA Program Lead
NASA Kennedy Space Center, Environmental Management Branch
Kennedy Space Center, Florida 32899
E-mail: james.t.brooks-1@nasa.gov

NASA Kennedy Space Center Master Plan
Programmatic Environmental Assessment

FACT SHEET **April 2025**

National Environmental Policy Act (NEPA)

The Programmatic EA will satisfy NASA's obligations under the National Environmental Policy Act (NEPA) and ensure compliance with a variety of federal statutes, such as the Endangered Species Act, National Historic Preservation Act, and Coastal Zone Management Act.

Agency and Public Involvement

NASA is currently in the scoping phase of the NEPA process and is seeking agency comments. NASA is seeking your input in identifying community interests, specific resources to analyze, or alternatives to consider in the PEA. This is your opportunity to submit questions you may have as stakeholders at KSC regarding this project.

When available, a Notice of Availability (NOA) will be published in the *Florida Today* newspaper and on the KSC website notifying the public of the availability of the draft PEA for review.

Resource Areas to be Analyzed

The Programmatic EA will include detailed analysis of the following resource areas:

- Air Quality
- Biological Resources
- Water Resources
- Cultural Resources
- Hazardous Materials and Wastes
- Land Use
- Utilities and Infrastructure

For more information on the Proposed Action, please contact:

James T. Brooks, NEPA Program Lead
NASA Kennedy Space Center, Environmental Management Branch
Kennedy Space Center, Florida 32899
E-mail: james.t.brooks-1@nasa.gov

Appendix B
Area Development Plan Project Descriptions

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Central Campus/Processing District

Short-Term Phasing Projects

Eight projects were identified for the short-term phase:

A) *Construct Contemplative Green Spaces* – Kennedy Space Center (KSC) has a memorial grove of trees dedicated to the Challenger accident immediately west of the old Central Campus Headquarters (HQ) Building footprint. Improved landscaping, seating, and walking paths would provide employees with additional recreational amenities and collaboration opportunities in a contemplative outdoor setting.

B) *Provide Electric Vehicle (EV) Charging Infrastructure Throughout the District* – Additional EV charging stations will provide employees with greater access to this capability as EVs become more common.

C) *Implement Pedestrian Improvements* – A focus on pedestrian improvements/connections to contemplative green spaces and major facilities will reduce traffic and parking congestion and boost personnel mental and physical wellness.

D) Construct *Orion Clamshell* – A clamshell structure to store the Orion capsule in the southern portion of the district.

E) Construct *Applied Science and Technical Analysis Facility* – This facility consolidates Center-wide non-hazardous or minimally hazardous lab capabilities from space within operational and functionally obsolete facilities into a dedicated facility. The facility also contains space to house administrative functions that are currently scattered across KSC.

F) *Repair/Upgrade Sewage Conveyance System* – Construction of approximately six miles of force main from Lift Station 1AA (LS-1AA) in the Industrial Area to the Cape Canaveral Space Force Station (CCSFS) Regional Wastewater Treatment Facility (RWWTF); six miles of force main from Lift Station 4A (LS-4A) in the VAB District to LS-1AA; and refurbishment of surge tanks, pumps, and controls.

G) *Renovate Communication Distribution and Switching Center and IT Network* – Implement mechanical system upgrades to ensure NASA and commercial IT requirements are sufficiently maintained in the short term; additional enhancements to KSC's IT network are needed to ensure NASA and its partners have reliable, efficient means of transferring technology securely. **Note: this project is also considered to be a Mid-Term Phasing Project.**

H) *Implement Stormwater Improvements* – Upgrades include culvert restorations and drainage system improvements that will reduce localized road flooding and improve stormwater treatment before discharge, which will support improved water quality in the Indian River Lagoon. This is a Center-wide project that includes, but is not limited to, the Central Campus/Processing District. **Note: this project is also considered to be a Mid-Term Phasing Project.**

Mid-Term Phasing Projects

Nine projects were identified for the mid-term phase:

G) *Renovate Communication Distribution and Switching Center and IT Network* – This is a continuation of the upgrades associated with KSC's IT network that will begin in the short-term.

H) *Implement Stormwater Improvements* – This is a continuation of near-term stormwater improvements that will continue to be needed over time as KSC experiences additional development and more significant weather events.

I) *Replace/Divest Child Development Center (CDC)* – KSC's existing CDC is in significant need of repair and investment due to its age. A non-NASA entity could provide this service to both KSC and partner employee children that reduces NASA's cost burden toward operating/maintaining this facility. The facility is proposed to be demolished and replaced with a new facility east of A Avenue SE.

J) *Outgrant/Divest/Independent Operating Zone (IOZ) Space in Space Station Processing Facility (SSPF)* – Due to unknown future NASA program requirements, there are opportunities to repurpose SSPF high-bay space at the currently identified terminus of the International Space Station (ISS) program in 2030; the high-bay space in this facility could accommodate these future mission needs. KSC is currently exploring divestment and/or outgrant options for this space.

K) *Upgrade Orsino Substation* – The Orsino Substation provides power to critical processing facilities, such as the SSPF and Multi-Payload Processing Facility (MPPF), as well as several other facilities that process mission-critical flight hardware. Upgrades to the Orsino Substation would provide backup power so that it can continue to support facilities when there is a loss of commercial power.

L) *Modernize and Upgrade Physical Security Infrastructure* – Updates to the horizontal infrastructure (additional fencing surrounding KSC's secured area, intrusion detection systems, canopies over guard shacks, etc.) will provide additional security protection to ensure NASA operations are adequately protected.

M) *Extend Chilled Water Loop* – Extending KSC's chilled water loop to facilities (e.g., MPPF, Payload Hazardous Servicing Facility [PHSF], Launch Abort System Facility [LASF]) in the Central Campus/Processing District would replace aging air-cooled chillers that have short life spans. This project would require upgrades to the existing Industrial Area Chiller Plant (IACP) but result in reduced maintenance costs, sustainability credits, and greater resiliency to critical payload processing facilities in the Central Campus/Processing District.

N) *Construct Emergency Support Facility* – A new spaceport emergency support facility will provide KSC with the ability to consolidate multiple operations that are currently scattered across KSC. While this facility would consolidate Fire Station 1 and the Occupational Health Facility, it would also relocate KSC's Emergency Operation Center (EOC) and Radiological Control Center (RADCC) that are currently occupying needed real estate in other facilities. Relocating these functions would provide NASA programs with greater efficiency and flexibility toward utilizing mission-critical facilities, such as the Launch Control Center, for other uses required for launch support.

O) *Demolish/Replace Roy D. Bridges Bridge* – While NASA has no near-term mission requirements for utilizing the Roy D. Bridges Bridge for large-scale transports, the growing number and frequency of NASA partner transports that rely exclusively on Saturn Causeway and Launch Complex-39A (LC-39A) Bypass Road is resulting in a transportation corridor pinch point for its partners. By upgrading this bridge to be able to support large payload segment movements, it would

provide a second corridor between KSC and CCSFS, thereby improving efficiencies for KSC, CCSFS, and its tenants. A redesigned bridge that provides this capability could also result in removing portions of the Banana River Causeway that reduce flow from the northern end of the Indian River Lagoon to other parts of the Indian River Lagoon south of KSC and CCSFS. This improved flow would provide significantly enhanced downstream effects toward improving the water quality of the Indian River Lagoon system throughout Brevard County. To achieve the desired design upgrades, the bridge would be demolished and subsequently replaced. Because this is considered a historic bridge, appropriate consultations and permits must be made in advance.

Long-Term Phasing Projects

Seven projects were identified for the long-term phase:

P) *Demolish Facilities Programmed for Central Campus HQ Phase 2* – Central Campus HQ Phase 2 consolidates numerous functions scattered in aging facilities across KSC into one administrative hub. This consolidation will reduce NASA's maintenance costs, utility demands, and real property footprint on KSC, and demolition of these obsolete facilities will provide developable land to accommodate future growth. In particular, Central Campus HQ Phase 2 could replace the functions currently served by Operations Support Building (OSB) 1. By 2032, the OSB 1 will be 42 years old and will continue to require significant investments for it to remain operational; instead of continuing to fund maintenance repairs, Central Campus HQ Phase 2 would decrease the long-term costs by relocating those administrative functions to a new facility close to Central Campus HQ Phase 1 and existing administrative functions.

Q) *Construct Central Campus HQ Phase 2* – Central Campus HQ Phase 2 has the ability to support KSC's growing and evolving administrative requirements, especially those that continue to emerge as NASA's contractor base grows and diversifies. Central Campus HQ Phase 2 could also include non-administrative functions including, but not limited to, collaboration spaces and meeting spaces that could accommodate NASA and commercial partner needs.

R) *Demolish Facilities Programmed for the Consolidated Warehouse Facility (See VAB District ADP)* – The western region of the Central Campus/Processing District houses many aging, inefficiently located warehouse facilities. Consolidation of warehouse facilities into a new warehouse facility (to be located in the VAB District) will provide NASA with greater operational efficiencies by demolishing aging assets that need upgrades. The demolition and subsequent consolidation of these assets will also reduce NASA's maintenance cost burden by reducing its operational footprint while also facilitating opportunities for new non-NASA development on previously disturbed property.

S) *Demolish Facilities Programmed for the Consolidated Maintenance Complex (See VAB District ADP)* – Maintenance shops at KSC are small and scattered throughout KSC. Many of these facilities are in poor condition; consolidation of maintenance functions into a centralized complex (to be located in the VAB District) will provide a hub for storage and maintenance operations at KSC. Demolition of these numerous small facilities, primarily located in the west industrial area, will provide NASA with greater operational efficiencies by reducing its maintenance costs and real property footprint, freeing up developable land to accommodate future growth.

T) *Construct New Communication Distribution and Switching Center* – While repairs can extend the life of the existing Communication Distribution and Switching Center, a new facility is

ultimately needed to replace the existing and functionally obsolete Center-wide communication and distribution hub. A modern facility will allow KSC to meet the growing requirements of a multi-user spaceport more efficiently.

U) *Repurpose Operations and Checkout (O and C) South Wing Labs* – Once relocated to the Applied Science and Technical Analysis facility, the existing O and C lab space could then be repurposed to allow for additional processing and/or launch support requirements needed for NASA programs such as Orion, which already operates in the O and C high bay.

V) *Extend 3rd Street SE* – There is limited developable land at KSC to support burgeoning demand for additional processing facilities. Extending 3rd Street SE from its current termination point at E Avenue SE to intersect with Banana River Drive would provide greater opportunities for future NASA and partner development. This new roadway would provide infrastructure to incentivize additional development on property that has already been withdrawn from MINWR management. There is sufficient space to accommodate hazardous processing in this area.

Capacity Projects

Two capacity projects were identified:

W) *Redevelop Fire Training Area* – While NASA still maintains this area on a periodic basis as an area to conduct security training exercises, this function could be relocated to another site on Center. Due to the isolated nature of this property, the Fire Training Area serves as a potential location for partners to conduct hazardous forms of testing that require large quantity distance (QD) buffers while also remaining inside KSC's secured area. Additional environmental remediation would need to be conducted to enable this site for any type of future development.

X) *Implement Banana River Drive Sea-Level Rise Stabilization* – Due to increasing flood concerns in the Central Campus/Processing District, stabilization improvements and/or road elevation measures to Banana River Drive SE would provide additional protection from flooding concerns within the district. Since this area is one of the last remaining developable pieces of property on KSC that could accommodate hazardous operations and associated QD setbacks, these infrastructure stabilization projects will preserve that development opportunity if future requirements arise.

Exploration Launch District

Short-Term Phasing Projects

Six projects were identified for the short-term phase:

A) *Conduct Dune/Beach Restoration* – Dune and beach restoration projects are needed to combat the intensified effects of storms on the property caused by climate change. Dunes play a critical role in protecting beaches from erosion and inland areas from storm surges and provide critical habitat for coastal wildlife. Ultimately, maintaining the dunes at KSC is necessary for protecting its critical launch infrastructure.

B) *Implement Scrub Habitat Mitigation Strategies* – This project aims to reestablish, remediate, and protect wetlands throughout the district and other areas of KSC; this is a Center-wide project that includes, but is not limited to, the Exploration Launch District.

C) *Replace LC-39 Area Duct Bank* – This project will provide a means to replace aged and deteriorated feeders by constructing 2.5 miles of electrical duct bank infrastructure between C-5

Substation and Switch Station 900. This project will increase capacity and accommodate electrical demand growth in the VAB and Exploration Launch Districts.

D) *Construct Liquefied Natural Gas (LNG) Line* –LNG is a new rocket propellant that is seeing adoption across many launch entities due to its lower cost, reduced environmental impact, and simplicity of handling compared to traditional rocket propellants. NASA missions are seeking improved propellants to advance spaceflight to Mars; this infrastructure will bring the benefits of LNG propellants to NASA and commercial partners at KSC. This project would occur within the utility corridor of Saturn Causeway and extend to the launch pads.

E) *Upgrade Stormwater Treatment Infrastructure* – This is a Center-wide project that includes, but is not limited to, the Exploration Launch District. These upgrades include culvert restorations and drainage system improvements that will reduce localized road flooding and improve the stormwater treatment before discharge, which will support improved water quality in the Indian River Lagoon.

F) *Enable/Construct LC-48* – The existing LC-48 launch pad, designed for small-class launches, also has the capacity to support an additional launch/landing pad to the south of the existing pad. This would provide NASA or commercial users with a site to conduct small launch operations with minimal impacts to other operations in the district. Its proximity to the coast minimizes overflight hazards, making it ideal for landing as well.

Mid-Term Phasing Projects

Three projects were identified for the mid-term phase:

G) *Improve Pad LC-39B Bypass Road to Serve as Improved Access to Phillips Parkway* – Many partners who launch from CCSFS use KSC roads to access the Cape. With the unsuitability of the Roy D. Bridges Bridge for payload transport, the only alternative route is using Saturn Causeway, Pad 39A Bypass Road, and Phillips Parkway to access CCSFS from the north. When operations at Pad 39A require closure of Pad 39A Bypass Road, however, privately-owned vehicle (POV) access and payload transportation are blocked. As launch tempo increases, these closures are expected to become more frequent and an additional bypass road at Pad 39B suitable for payloads is needed to ensure consistent access to CCSFS.

H) *Renovate Phillips Parkway Roadway* – To align with the CCSFS Spaceport of the Future Plan, Phillips Parkway requires modifications to make it more suitable for the payload transports it receives. Widening the right-of-way and building pull-offs will facilitate payload transport, ensuring no transport bottlenecks occur.

I) *Add/Repair High-Pressure Gas Batteries* – KSC's high-pressure gas batteries that store helium and nitrogen should be refurbished to enhance pressure rates before and during launch. This upgrade will reduce the likelihood of scrubs and provide KSC and its partners with greater launch resiliencies.

Long-Term Phasing Projects

Four projects were identified for the long-term phase:

J) *Elevate/Improve Phillips Parkway* – Phillips Parkway is subject to regular flooding, washouts, and damage from storms, which are all expected to worsen due to climate change and sea-level rise.

Phillips Parkway is a critical transportation route for payloads to CCSFS. This project elevates the road subgrade, base, and pavement and constructs drainage improvements to minimize damage from the rising groundwater table.

K) *Improve Titusville Beach Road Access (two-way, paved)* – The proposed LC-49 site in the Exploration Launch District has been identified to support future medium and heavy launch capabilities if the requirement arises. This project improves Titusville Beach Road to facilitate better access to this area and facilitate future development.

L) *Create Titusville Beach Road Utility Corridor* – This project should be completed in conjunction with the Titusville Beach Road Access project to provide utility services to the proposed LC-49 site.

M) *Construct Substation* – The Exploration Launch District will require significant electrical power upgrades to support the level of activity NASA anticipates occurring in the district. An additional substation near the launch pads, along with an increased capacity transmission line onto KSC, will ensure that NASA is able to continue its operations without any disruption caused by the demands of commercial activities. NASA is actively working with commercial partners to plan for a higher-voltage transmission line onto KSC that can provide its partners with additional power not able to be provided by C-5 Substation and its existing transmission line.

Capacity Projects

Three capacity projects were identified:

N) *Construct LC-49 Future Medium/Heavy Launch Capacity* – KSC has identified this parcel of land as potentially suitable for future medium or heavy launch and landing facilities and associated infrastructure. While there is no current NASA requirement for this capability, this plan earmarks the site in case a future NASA program need arises that warrants an additional medium/heavy launch site. Due to the environmental sensitivity of this property, along with its proximity to Canaveral National Seashore (CANA), this plan preserves NASA's ability to utilize LC-49 for only a critical, future NASA need.

O) *Construct Future Small-Class Vehicle Landing Site* – NASA has identified this parcel as a potential future site to develop a landing pad that will support NASA and commercial demand for this capability as the technology matures. Such infrastructure can be designed with temporary, modular plug-and-play facilities that are able to suit the needs of a wide range of users and requirements. This site will require environmental and safety mitigation efforts and coordination with other launch activities in the district.

P) *Construct Future Landing Site* – NASA has identified this parcel as being potentially able to support a future landing site for reusable launch vehicles. While there is no existing requirement to develop this site, this plan identifies future areas where such development could occur should the need arise. This site, like the site identified to the north, should employ a flexible design to support a wide range of needs and enable quick turnaround for users.

Vehicle Assembly Building District

Short-Term Phasing Projects

Eight projects were identified for the short-term phase:

A) *Construct Liquid Oxygen / Liquid Nitrogen Plant* – KSC has experienced increases in demand for launch commodities as the commercial launch tempo has grown and expects this to continue in the future. An on-site air separation unit will increase the capacity and reliability of KSC's liquid oxygen and liquid nitrogen infrastructure, ensuring continued mission success for NASA and commercial partners.

B) *Upgrade Converter Compressor Facility (CCF)* – The CCF requires significant modernization and equipment upgrades to continue to supply the launch pads with sufficient gases (e.g., nitrogen and helium). CCF Phase 1 work includes capturing vented helium in tanks and has minimal recovery equipment to pressurize and reintroduce the helium to the pipeline system. This project would remove legacy gaseous helium compressors and the pneumatic console and purchase new helium compressors that can recover and pressurize the vented helium more efficiently and reliably than the Phase 1 system. This will decrease helium costs for all helium users.

C) *Construct Payload Processing Facility* – KSC has designated a site in the southern end of the VAB District to accommodate a state-of-the-art, multi-user Payload Processing Facility. The demand for payload processing continues to grow with the advent of commercial space, so this facility will provide NASA programs and partners with additional capabilities and options.

D) *Upgrade Saturn Causeway Utilities* – The utilities that run along Saturn Causeway to the launch pads require upgrades to serve the next generation of large launch vehicles. This project provides a 16-inch natural gas line that would provide additional support to a methane farm at LC-39A, an exclusive-use partner utility duct bank, and space for a NASA electric duct bank to serve LC-39B and other NASA operations. Some wetlands will be disturbed since the new LNG line will extend outside of the existing utility corridor. This ensures that existing NASA infrastructure is adequately protected from newly installed utilities within this corridor. This utility corridor is the only interface between the KSC launch infrastructure and the VAB and other critical NASA processing facilities, so modifications must be carried out as strategically as possible while ensuring NASA operations are not impacted.

E) *Add C-5 Substation Capacity* – The C-5 Substation is backed up by an emergency power plant, but its capacity is not adequate to support all loads that require backup. Adding a 10-megawatt (MW) generator capacity will allow current and anticipated future loads to be covered. Transformers could also be added to C-5 to provide NASA partners with increased power supply. Additional power infrastructure could also be run from C-5 to the Mobile Launcher Platform (MLP) Park site area to provide greater resilience for future Artemis operations.

F) *Modify and Stabilize Roadways to Mitigate Climate Change* – Phase 1 includes roadways most at risk of erosion and flooding that impact spaceport operations and launch cadence. Roads susceptible to flooding and road base degradation due to higher water levels resulting from sea-level rise are included in this phase. By 2029, approximately 1.5 miles of roadways are expected to have base courses that may be in danger of degradation due to high groundwater and will need to be raised up to a foot to prevent degradation. **Note: this project is also considered to be a Mid-Term Phasing Project.**

G) *Construct Supplemental Gaseous Nitrogen (GN_2) Pumping System* – This project is to construct a new system that will supplement the current GN_2 pumping capability at Air Liquide and be used for outages, maintenance, and multi-user high-flow events. The current system is undersized to meet

the ten-year launch forecast and is limited in meeting concurrent launch countdown flowrates. This project will install a liquid nitrogen storage tank, liquid nitrogen pumps and vaporizers, and a control system to operate the system.

H) *Construct New Press Site* – The current Press Site has been used since the formation of KSC to broadcast iconic launches to millions of viewers around the world. However, increasingly large QD arcs are compromising the site. The NASA-owned facilities are in poor condition, and the leased facilities are temporary and not designed for long-term use. This plan relocates the Press Site to a more suitable location, ideally close to the historic site but not interfering with lines-of-sight to the Launch Control Center (LCC). Blast-resistant construction will mitigate QD-arc-related constraints, but additional environmental studies or mitigation efforts may be necessary to ensure long-term viability of the new site.

Mid-Term Phasing Projects

Three projects were identified for the mid-term phase:

F) *Modify and Stabilize Roadways to Mitigate Climate Change* – This is a continuation of KSC's modification and stabilization efforts to mitigate climate change that will begin in the short-term.

I) *Renovate Launch Support Equipment* – Replacement of mechanical equipment, cranes, and other large launch support equipment will provide future operations with greater efficiencies. Other upgrades to hardware inside facilities, including the VAB, LCC, and other launch-critical facilities, will ensure that NASA is able to support its growing launch manifest.

J) *Mitigate Climate Change – Critical Facility Flood Fortification* – Structurally defensive measures are implemented to directly protect critical facilities against future flood impacts. This project includes evaluating permanent flood protection options, such as retrofitting existing buildings or building replacements.

Long-Term Phasing Projects

Four projects were identified for the long-term phase:

K) *Construct Centralized Warehouse* – Currently, warehousing functions are scattered across KSC's landholdings. This project will consolidate 45 other facilities of various conditions into one modern facility in the VAB District at a location easily accessible to users. Consolidation of warehouse facilities will provide NASA with greater operational efficiencies by demolishing aging assets that need upgrades. The demolition/consolidation of these assets will also reduce NASA's maintenance cost burden by reducing its operational footprint while also facilitating opportunities for new non-NASA development on previously disturbed property.

L) *Construct Centralized Maintenance Complex* – This Future Development Center (FDC) project will greatly increase the efficiency of KSC's maintenance and shops by consolidating their operations under one roof in the VAB District, centrally located near the main activity nodes of KSC. Fourteen facilities will be consolidated into this complex. Maintenance shops at KSC are small and scattered throughout KSC. Many of these facilities are in poor condition; consolidation of maintenance functions into a centralized complex in the VAB District will provide a hub for storage and maintenance operations at KSC. Demolition of these numerous small facilities, primarily located in the west industrial area, will provide NASA with greater operational efficiencies by

reducing its maintenance costs and real property footprint, freeing up developable land to accommodate future growth.

M) *Upgrade/Expand State Road 3 Payload Transportation* – Payload transport from the Central Campus/Processing District along Kennedy Parkway creates a traffic bottleneck. This problem will only worsen as launch tempo at KSC rises. Kennedy Parkway needs widening to accommodate larger payloads, and Contractors Road could also be expanded to accommodate additional privately-owned vehicle (POV) traffic, potentially even a secondary payload route, by utilizing the old railroad right-of-way. This would create a redundant transportation network for payload and POV traffic between the VAB District and the Central Campus/Processing District, ensuring traffic flows freely between the major activity hubs of KSC. Additional traffic engineering analysis is needed before proceeding with these upgrades.

N) *Outgrant/Demolish Operational Support Building (OSB) 1* – OSB 1 is an office building built in 1990; by 2040, this facility will be 50 years old and will continue to require additional maintenance investments. NASA divestment of this facility will result in an approximately 300,000 GSF and over $60 million in current replacement value (CRV) reduction and allow administrative functions to consolidate into Central Campus HQ Phase 2. OSB 1 does hold a highly strategic location for critical launch administration functions – the facility could be outgranted to a partner needing administrative space in the VAB Area, allowing NASA to retain some space in the facility as it deems necessary, or it could be demolished to create room for future processing or launch support facilities in a prime location.

* *Demolition of Buildings for Consolidation* – As part of the consolidation for projects K and L above, multiple buildings in the VAB District and the Central Campus/Processing District are proposed to be demolished.

Capacity Projects

Three capacity projects were identified:

O) *Construct Advanced Exploration Processing Facility* – A MPPF in the VAB District will further increase KSC's processing throughput. Low and high bays certified for hazardous processing, equipment airlocks, and clean rooms are in high demand for anticipated future NASA missions and can be leased to partners as well. This site would involve environmental mitigations due to the large setbacks needed to ensure there is sufficient buffer property between it and other NASA facilities.

P) *Expand Wharf Support Facilities/Turn Basin* – As a premier multi-user spaceport, KSC receives payloads from a variety of modes of transportation, including by barge at the Turn Basin. As payloads increase in size, expanding the Turn Basin will ensure that the demand for payload receiving can be spread across KSC. Expansion of the wharf to include support facilities and storage will facilitate rapid unloading and smooth transitions to the necessary facilities on KSC.

Q) *Connect Banana Creek and Indian River Lagoon* – This project would greatly benefit the health of the Indian Lagoon River by restoring the connection from Banana Creek to the Lagoon under the Crawlerway and Saturn Causeway.

Parcel Opportunity Analysis (POA)

Parcel 1: Parcel 1 is located within the Central Campus/Processing District. This parcel comprises 37.2 acres of open land at the site of the demolished Central Instrumentation Facility (CIF) and Base Operations Building (BOB). There are no known natural constraints (such as wetlands, floodplains, or habitat for special status species, et al.) that would impact development on this parcel. An abandoned rail line runs north to south immediately east of B Avenue SE. However, this rail is currently unusable and is unlikely to become operational in the future. Parcel 1 presents a line of sight (LOS) constraint running diagonally through the western portion of the parcel. Most utility systems have the capacity to support future development projects. This property could accommodate approximately 15 acres of new development consisting of administrative, community, and/or light industrial uses. Specific facilities could include a warehouse, conference center, administration building, and/or academic research facility.

Parcel 3: Parcel 3 is located southeast of the Space Systems Processing Facility within the eastern portion of the Central Campus/Processing District. This parcel consists of 186.4 acres and includes the defined limits of NASA Parkway to the north, undeveloped wetlands and floodplains to the east, 500 feet to the west of E Avenue, and 5th Street to the south. Permitted land uses in this parcel include hazardous activities, heavy and light industrial, administrative, community support, and open space. A total of 84.6 acres of Parcel 3 is considered developable. These areas consist of open, undeveloped land or land areas from the potential demolition of the boresight test facilities. Due to the large size of Parcel 3, three sub-parcels were conceptualized for potential development options. A description of each sub-parcel can be found below.

Parcel 3A

Parcel 3A is located within the northern portion of Parcel 3 immediately south of NASA Parkway East and east of H Avenue SE. Allowable building types in Parcel 3A include administrative and light industrial. Natural constraints of Parcel 3A include Florida scrub-jay habitat, forested areas, wetlands, and both 100-year and 500-year floodplains. Parcel 3A presents an LOS constraint running diagonally through the center of the parcel. Utilities are prevalent along the roadways adjacent to Parcel 3A. This property could accommodate approximately 11.6 acres of new development consisting of administrative, light industrial, and/or heavy industrial uses. Access would stem off NASA Parkway.

Parcel 3B

Parcel 3B is located within the southwestern portion of Parcel 3. Parcel 3B is split by E Avenue SE. Allowable building types in Parcel 3B include laboratories and light industrial. Natural constraints of Parcel 3B include Florida scrub-jay habitat and the 500-year floodplain on the eastern side of E Avenue SE. Parcel 3B presents an LOS constraint running diagonally through the center of the portion west of E Avenue SE. Two LOS constraints are immediately east of the portion east of E Avenue SE. However, these LOS constraints are outside Parcel 3B. Utilities are prevalent along the roadways adject to Parcel 3B. This property could accommodate approximately 57 acres of new development consisting of light industrial, laboratory space, and/or administrative uses.

Parcel 3C

Parcel 3C is located within the southeastern portion of Parcel 3. Parcel 3C is immediately north of 5th Street SE. Allowable building types in Parcel 3C include industrial and hazardous. Natural constraints of Parcel 3C include Florida scrub-jay habitat, forested areas, wetlands, and both 100-year and 500-year floodplains. Parcel 3C presents 3 LOS constraints running diagonally through the parcel. One LOS constraint runs through the northwestern corner of the parcel and two LOS constraints run parallel with each other on the eastern side of the parcel. Utilities are not prevalent in the vicinity of Parcel 3C. This property could accommodate approximately 60 acres of new development consisting of a hazardous processing facility and associated support facilities. An additional 10 acres could be utilized to accommodate hazardous testing operations or other types of smaller scale uses.

Parcel 4: Parcel 4 is located on the eastern edge of the Central Campus/Processing District. Parcel 4 comprises largely undeveloped land south of NASA Parkway E, west of Banana River Drive, and north of 10th Street. Allowable building types in Parcel 4 include hazardous, heavy and light industrial, administrative, and open space. Natural constraints of Parcel 4 include Florida scrub-jay habitat, forested areas, wetlands, and both 100-year and 500-year floodplains. Parcel 4 presents three LOS constraints with one running northwest to southeast intersecting the middle of the parcel and two LOS constraints running parallel in the northern section of the parcel. Utilities are limited in this parcel along roadways due to minimal previous development. This property could accommodate approximately 35 acres of new development for laydown yard space and/or temporary forms of hazardous testing. This project would require a new road that would run parallel to Banana River Drive to its west.

Center Development Plan

Upgraded Transmission Line: The existing electrical transmission system that connects the mainland to KSC would be upgraded from 115 kV to 230 kV. This upgrade would require a new 100-foot-wide transmission line.

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Appendix C
Air Quality Calculations

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TAB A. **Short-Term Construction Emissions Summary**

Annual Short Term (0-5 years) Construction Project Emissions

	VOC Tons	**CO** Tons	**NOx** Tons	**SO2** Tons	**PM10** Tons	**PM2.5** Tons	**CO_2** Metric Tons
Central Campus District	0.18	0.91	4.03	0.00	4.10	0.56	698
Exploration Launch District	0.37	1.94	8.35	0.01	109.93	11.31	1,243
Vehicle Assembly Building District	1.00	5.18	23.09	0.01	4.18	1.26	2,584
Total	**1.55**	**8.03**	**35.46**	**0.02**	**118.22**	**13.12**	**4,525**

TAB B. **Central Campus Emissions**

Table 1.1 **Site Prep** 615,376 SF

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
Dozer	135	275	0.58	0.02	0.09	0.29	0.001	0.02	0.02	537
Loader/Backhoe	180	300	0.48	0.03	0.17	0.50	0.001	0.03	0.03	537
				VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
			Dozer	0.93	4.19	13.91	0.07	0.79	0.76	25,480
			Loader/Backhoe	1.98	9.48	28.37	0.08	1.76	1.71	30,670
			Subtotal in lbs	3	14	42	0	3	2	56,150
			Site Prep Total in Tons	**0.00**	**0.01**	**0.02**	**0.00**	**0.00**	**0.00**	
			Site Prep Total in Metric Tons							**25**

6 working days
8.75 Trips per day
20 miles per trip

Table 1.2 **Site Prep - Worker Trips**

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM_{10} lb/mile	$PM_{2.5}$ lb/mile	CO_2 lb/mile
Light-duty Truck	984	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
			VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
		Light-duty Truck	1.50	7.92	35.51	0.02	1.48	1.43	3,385
		Subtotal (lbs):	1	8	36	0	1	1	3,385
		Site Prep Worker Trips Grand Total in Tons	**0.00**	**0.00**	**0.02**	**0.00**	**0.00**	**0.00**	
		Site Prep Worker Trips Grand Total in Metric Tons							**2**

Table 1.3 **Grading** 61,479 CY

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
Dozer	546	275	0.58	0.02	0.09	0.29	0.001	0.02	0.02	537
Grader	546	145	0.58	0.02	0.13	0.46	0.001	0.03	0.03	537
Excavator	1,093	450	0.53	0.03	0.20	0.55	0.001	0.03	0.03	537
Compactor	1,093	105	1	0.06	0.26	0.86	0.001	0.06	0.06	537
Loader/Backhoe	1,093	300	0.48	0.03	0.17	0.50	0.001	0.03	0.03	537
				VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
			Dozer	3.76	16.97	56.32	0.28	3.18	3.09	103,149
			Grader	2.03	13.49	46.62	0.15	3.14	3.04	54,388
			Excavator	18.37	116.83	315.37	0.85	18.71	18.15	308,455
			Compactor	13.98	66.67	217.99	0.38	14.74	14.30	135,782
			Loader/Backhoe	12.01	57.54	172.27	0.51	10.68	10.36	186,235
			Subtotal in lbs	50	271	809	2	50	49	788,008
			Site Prep Total in Tons	**0.03**	**0.14**	**0.40**	**0.00**	**0.03**	**0.02**	
			Site Prep Total in Metric Tons							**357**

5,123 Truck trips
20 miles per trip

Table 1.4 **Grading - Hauling**

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM10 lb/mile	PM2.5 lb/mile	CO_2 lb/mile
Dump Truck (12 CY)	102,465	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
			VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
		Dump Truck (12 CY)	155.88	824.02	3,695.94	1.85	154.16	149.37	352,332
		Subtotal in lb:	156	824	3,696	2	154	149	352,332
		Demo Hauling Grand Total in Tons	**0.08**	**0.41**	**1.85**	**0.00**	**0.08**	**0.07**	
		Demo Hauling Grand Total in Metric Tons							**160**

68 working days
10 Trips per day
20 miles per trip

Table 1.5 **Grading - Worker Trips**

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM_{10} lb/mile	$PM_{2.5}$ lb/mile	CO_2 lb/mile
Light-duty Truck	13,662	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
			VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
		Light-duty Truck	20.78	109.87	492.79	0.25	20.55	19.92	46,978
		Subtotal (lbs):	21	110	493	0	21	20	46,978
Site Prep Worker Trips Grand Total in Tons			**0.01**	**0.05**	**0.25**	**0.00**	**0.01**	**0.01**	
Site Prep Worker Trips Grand Total in Metric Tons									**21**

Table 1.6 **Bldg. Const.** 126,446 SF

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
Crane	3,430	150	1	0.04	0.18	0.86	0.001	0.04	0.04	531
Forklift	11,760	74	0.48	0.05	0.20	2.55	0.002	0.02	0.02	596
Loader/Backhoe	10,290	300	0.48	0.03	0.17	0.50	0.001	0.03	0.03	537
Welder	3,430	10	0.19	1.17	5.27	4.76	0.003	0.61	0.59	693
Generator Set	3,920	264	0.43	0.21	0.67	2.57	0.002	0.13	0.13	530
				VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
			Crane	46.98	198.91	979.62	1.67	46.20	44.82	602,220
			Forklift	47.08	179.67	2,345.72	1.45	14.58	14.14	548,857
			Loader/Backhoe	113.10	541.70	1,621.92	4.81	100.55	97.53	1,753,357
			Welder	16.83	75.72	68.34	0.04	8.81	8.55	9,952
			Generator Set	210.29	659.18	2,522.44	1.66	131.02	127.09	520,378
			Subtotal in lbs	434	1655	7538	10	301	292	3,434,763
Site Prep Total in Tons				**0.22**	**0.83**	**3.77**	**0.00**	**0.15**	**0.15**	
Site Prep Total in Metric Tons										**1,558**

490 working days
53 Trips per day
20 miles per trip

Table 1.7 **Bldg. Constr. - Worker Trips**

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM_{10} lb/mile	$PM_{2.5}$ lb/mile	CO_2 lb/mile
Light-duty Truck	520,452	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
			VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
		Light-duty Truck	791.77	4185.46	18772.72	9.39	783.00	758.69	1,789,595
		Subtotal (lbs):	792	4,185	18,773	9	783	759	1,789,595
Bldg. Constr. Worker Trips Grand Total in Tons			**0.40**	**2.09**	**9.39**	**0.00**	**0.39**	**0.38**	
Bldg. Constr. Worker Trips Grand Total in Metric Tons									**812**

490 working days
21 trips per day
20 miles per trip

Table 1.8 **Bldg. Constr. - Material Delivery**

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM_{10} lb/mile	$PM_{2.5}$ lb/mile	CO_2 lb/mile
Dump Truck (12 CY)	203,100	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
			VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
		Light-duty Truck	308.98	1633.32	7325.83	3.66	305.56	296.07	698,368
		Subtotal (lbs):	309	1,633	7,326	4	306	296	698,368
Excavation Hauling Grand Total in Tons			**0.15**	**0.82**	**3.66**	**0.00**	**0.15**	**0.15**	
Excavation Hauling Grand Total in Metric Tons									**317**

Table 1.9 **Concrete Pav** 125,235 SF
89,551 CF

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
Paver	918	164	0.58	0.06	0.27	0.87	1.50E-03	0.06	0.06	537

Roller	612	401	0.58	0.05	0.31	0.85	1.52E-03	0.04	0.04	537
Loader/Backhoe	306	300	0.48	0.03	0.17	0.50	0.001	0.03	0.03	536.73
Paving Equipment	306	60	0.58	0.11	0.70	2.83	0.002	0.08	0.08	595.83
				VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
			Paver	10.64	52.73	167.40	0.29	11.84	11.49	103,264
			Roller	14.56	95.77	267.82	0.48	13.38	12.98	168,336
			Loader/Backhoe	3.36	16.10	48.21	0.14	2.99	2.90	52,115
			Paving Equipment	2.62	16.39	66.50	0.04	1.88	1.82	13,981
			Subtotal in lbs	31	181	550	1	30	29	337,697

On-road Equipment	**Hours of Operation**	**Engine HP**	**Productivity based Speed (miles/hour)**	**VOC** lb/mile	**CO** lb/mile	**NOx** lb/mile	**SO2** lb/mile	**PM10** lb/mile	**PM2.5** lb/mile	**CO_2** lb/mile
Dump Truck	306	230	17	0.001521	0.008042	0.036070	1.80E-05	0.001504	0.001458	3.438541
Water Truck	306	230	10	0.001521	0.008042	0.036070	1.80E-05	0.001504	0.001458	3.438541
				VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
			Dump Truck	7.91	41.81	187.55	0.09	7.82	7.58	17,878.59
			Water Truck	4.65	24.60	110.32	0.06	4.60	4.46	10,516.82
			Concrete Paving Grand Total in Tons	**0.02**	**0.12**	**0.42**	**0.00**	**0.02**	**0.02**	
			Concrete Paving Grand Total in Metric Tons							**166**

38 working days
8.75 Trips per day
20 miles per trip

Table 1.10 **Concrete Paving - Worker Trips**

On-road Equipment	**Miles**	**Engine HP**	**VOC** lb/mile	**CO** lb/mile	**NOx** lb/mile	**SO_2** lb/mile	**PM_{10}** lb/mile	**$PM_{2.5}$** lb/mile	**CO_2** lb/mile
Light-duty Truck	6,690	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
			VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
			Light-duty Truck	10.18	53.80	241.33	0.12	10.07	9.75	23,006
			Subtotal (lbs):	10	54	241	0	10	10	23,006
			Excavation Hauling Grand Total in Tons	**0.01**	**0.03**	**0.12**	**0.00**	**0.01**	**0.00**	
			Excavation Hauling Grand Total in Metric Tons							**10**

276 Truck Trips
20 miles per trip

Table 1.11 **Concrete Paving - Material Delivery**

On-road Equipment	**Miles**	**Engine HP**	**VOC** lb/mile	**CO** lb/mile	**NOx** lb/mile	**SO_2** lb/mile	**PM_{10}** lb/mile	**$PM_{2.5}$** lb/mile	**CO_2** lb/mile
Dump Truck (12 CY)	5,528	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
			VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
			Light-duty Truck	8.41	44.46	199.41	0.10	8.32	8.06	19,009
			Subtotal (lbs):	8	44	199	0	8	8	19,009
			Excavation Hauling Grand Total in Tons	**0.00**	**0.02**	**0.10**	**0.00**	**0.00**	**0.00**	
			Excavation Hauling Grand Total in Metric Tons							**9**

Table 1.12 **Demolition** 17,445 SF

Off-road Equipment	**Hours of Operation**	**Engine HP**	**Load Factor**	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO_2** g/hp-hr	**PM10** g/hp-hr	**PM2.5** g/hp-hr	**CO_2** g/hp-hr
Excavator	240	450	0.53	0.03	0.20	0.55	0.001	0.03	0.03	537
Dozer	160	275	0.58	0.02	0.09	0.29	0.001	0.02	0.02	537
				VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
			Excavator	4.03	25.65	69.25	0.19	4.11	3.99	67,732
			Dozer	1.10	4.97	16.49	0.08	0.93	0.90	30,200
			Subtotal in lbs	5	31	86	0	5	5	97,932
			Site Prep Total in Tons	**0.00**	**0.02**	**0.04**	**0.00**	**0.00**	**0.00**	
			Site Prep Total in Metric Tons							**44**

249 Truck trips

Table 1.13 **Demolition - Hauling** 20 miles per trip

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM10 lb/mile	PM2.5 lb/mile	CO_2 lb/mile
Dump Truck (12 CY)	4,975	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
			VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
		Dump Truck (12 CY)	7.57	40.01	179.45	0.09	7.48	7.25	17,107
		Subtotal in lb:	8	40	179	0	7	7	17,107
		Demo Hauling Grand Total in Tons	**0.00**	**0.02**	**0.09**	**0.00**	**0.00**	**0.00**	
		Demo Hauling Grand Total in Metric Tons							**8**

10 working days
6.25 Trips per day

Table 1.14 **Demolition - Worker Trips** 20 miles per trip

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM_{10} lb/mile	$PM_{2.5}$ lb/mile	CO_2 lb/mile
Light-duty Truck	1,250	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
			VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
		Light-duty Truck	1.90	10.05	45.09	0.02	1.88	1.82	4,298
		Subtotal (lbs):	2	10	45	0	2	2	4,298
		Excavation Hauling Grand Total in Tons	**0.00**	**0.01**	**0.02**	**0.00**	**0.00**	**0.00**	
		Excavation Hauling Grand Total in Metric Tons							**2**

Table 1.15 **Fugitive Dust Emissions**

Project	PM_{10} tons/acre/mo	acres	days of disturbance	PM_{10} from cut/fill CY	PM_{10} Total	$PM_{2.5}$ / PM_{10} Ratio	$PM_{2.5}$ Total
Project A	0.011	1	1	0.05	0.05	0.1	0.00
Project C	0.011	0.36	0	0.02	0.02	0.1	0.00
Project D	0.011	1.26	2	0.12	0.12	0.1	0.01
Project E	0.011	2.50	2	0.12	0.12	0.1	0.01
Project F	0.011	8.73	63	3.32	3.62	0.1	0.36
Annual					3.9		0.4

Table 1.16 **Total Emissions**

Year	VOC Tons	CO Tons	NOx Tons	SO2 Tons	PM10 Tons	PM2.5 Tons	CO_2 Metric Tons
Annual Short Term Emissions	0.18	0.91	4.03	0.00	4.10	0.56	698

TAB C. **Exploration Launch District Emissions**

Basic Conversions

453.59	grams per pound
43,560	Conversion from Acre to SF
0.03704	Cubic feet to Cubic Yards
0.1111	Square Feet to Square Yards
1.4	tons/CY for Gravel
80,000	lbs/Truck Load for Delivery
1.66	CY for each CY of asphalt/concrete demo
0.33333333	asphalt thickness for demolition
0.33333333	asphalt thickness for pavement
2000	pounds per ton
145	lb/ft^3 density of Hot Mix Asphalt

Table 2.1 **Site Prep** 914,100 SF

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
Dozer	504	275	0.58	0.02	0.09	0.29	0.001	0.02	0.02	537
Loader/Backhoe	672	300	0.48	0.03	0.17	0.50	0.001	0.03	0.03	537
				VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
			Dozer	3.46	15.64	51.90	0.26	2.93	2.85	95,061
			Loader/Backhoe	7.38	35.35	105.84	0.31	6.56	6.36	114,422
			Subtotal in lbs	11	51	158	1	9	9	209,484
			Site Prep Total in Tons	**0.01**	**0.03**	**0.08**	**0.00**	**0.00**	**0.00**	
			Site Prep Total in Metric Tons							**95**

21	working days
8.75	Trips per day
20	miles per trip

Table 2.2 **Site Prep - Worker Trips**

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM_{10} lb/mile	$PM_{2.5}$ lb/mile	CO_2 lb/mile
Light-duty Truck	3,672	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
			VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
		Light-duty Truck	5.59	29.53	132.46	0.07	5.52	5.35	12,628
		Subtotal (lbs):	6	30	132	0	6	5	12,628
		Site Prep Worker Trips Grand Total in Tons	**0.00**	**0.01**	**0.07**	**0.00**	**0.00**	**0.00**	
		Site Prep Worker Trips Grand Total in Metric Tons							**6**

Table 2.3 **Grading** 1,196,149 CY

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
Dozer	4,007	275	0.58	0.02	0.09	0.29	0.001	0.02	0.02	537
Grader	4,007	145	0.58	0.02	0.13	0.46	0.001	0.03	0.03	537
Excavator	8,014	450	0.53	0.03	0.20	0.55	0.001	0.03	0.03	537
Compactor	8,014	105	1	0.06	0.26	0.86	0.001	0.06	0.06	537
Loader/Backhoe	8,014	300	0.48	0.03	0.17	0.50	0.001	0.03	0.03	537
				VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
			Dozer	27.55	124.43	412.93	2.03	23.33	22.63	756,283
			Grader	14.92	98.88	341.81	1.07	23.01	22.32	398,768
			Excavator	134.68	856.58	2,312.28	6.24	137.21	133.09	2,261,581
			Compactor	102.49	488.83	1,598.29	2.78	108.10	104.86	995,549
			Loader/Backhoe	88.08	421.86	1,263.11	3.75	78.30	75.95	1,365,469
			Subtotal in lbs	368	1991	5928	16	370	359	5,777,650
			Site Prep Total in Tons	**0.18**	**1.00**	**2.96**	**0.01**	**0.18**	**0.18**	
			Site Prep Total in Metric Tons							**2,621**

99,679 Truck trips

Table 2.4 **Grading - Hauling** 20 miles per trip

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM10 lb/mile	PM2.5 lb/mile	CO_2 lb/mile
Dump Truck (12 CY)	1,993,582	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
			VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
		Dump Truck (12 CY)	3,032.88	16,032.32	71,908.59	35.97	2,999.28	2,906.16	6,855,012
		Subtotal in lb:	3,033	16,032	71,909	36	2,999	2,906	6,855,012
		Demo Hauling Grand Total in Tons	**1.52**	**8.02**	**35.95**	**0.02**	**1.50**	**1.45**	
		Demo Hauling Grand Total in Metric Tons							**3,109**

501 working days
10 Trips per day

Table 2.5 **Grading - Worker Trips** 20 miles per trip

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM_{10} lb/mile	$PM_{2.5}$ lb/mile	CO_2 lb/mile
Light-duty Truck	100,170	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
			VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
		Light-duty Truck	152.39	805.56	3613.13	1.81	150.70	146.02	344,438
		Subtotal (lbs):	152	806	3,613	2	151	146	344,438
		Site Prep Worker Trips Grand Total in Tons	**0.08**	**0.40**	**1.81**	**0.00**	**0.08**	**0.07**	
		Site Prep Worker Trips Grand Total in Metric Tons							**156**

Table 2.6 **Concrete Pav** 202,392 SF
200,332 CF

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
Paver	1,079	164	0.58	0.06	0.27	0.87	1.50E-03	0.06	0.06	537
Roller	720	401	0.58	0.05	0.31	0.85	1.52E-03	0.04	0.04	537
Loader/Backhoe	360	300	0.48	0.03	0.17	0.50	0.001	0.03	0.03	536.73
Paving Equipment	360	60	0.58	0.11	0.70	2.83	0.002	0.08	0.08	595.83
				VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
			Paver	12.51	62.03	196.91	0.34	13.93	13.51	121,469
			Roller	17.13	112.66	315.04	0.56	15.74	15.27	198,013
			Loader/Backhoe	3.95	18.94	56.71	0.17	3.52	3.41	61,303
			Paving Equipment	3.08	19.28	78.23	0.05	2.21	2.14	16,446
			Subtotal in lbs	37	213	647	1	35	34	397,231

On-road Equipment	Hours of Operation	Engine HP	Availability based Speed (miles/hour)	VOC lb/mile	CO lb/mile	NOx lb/mile	SO2 lb/mile	PM10 lb/mile	PM2.5 lb/mile	CO_2 lb/mile
Dump Truck	360	230	17	0.001521	0.008042	0.036070	1.80E-05	0.001504	0.001458	3.438541
Water Truck	360	230	10	0.001521	0.008042	0.036070	1.80E-05	0.001504	0.001458	3.438541
				VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
			Dump Truck	9.30	49.19	220.61	0.11	9.20	8.92	21,030.49
			Water Truck	5.47	28.93	129.77	0.06	5.41	5.24	12,370.88
			Concrete Paving Grand Total in Tons	**0.03**	**0.15**	**0.50**	**0.00**	**0.03**	**0.02**	
			Concrete Paving Grand Total in Metric Tons							**195**

45 working days
8.75 Trips per day

Table 2.7 **Paving - Worker Trips** 20 miles per trip

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM_{10} lb/mile	$PM_{2.5}$ lb/mile	CO_2 lb/mile
Light-duty Truck	7,870	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
			VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
		Light-duty Truck	11.97	63.29	283.87	0.14	11.84	11.47	27,061
		Subtotal (lbs):	12	63	284	0	12	11	27,061

Excavation Hauling Grand Total in Tons	**0.01**	**0.03**	**0.14**	**0.00**	**0.01**	**0.01**	
Excavation Hauling Grand Total in Metric Tons							**12**

Table 1.11 **Concrete Paving - Material Delivery**

618 Truck Trips
20 miles per trip

On-road Equipment	**Miles**	**Engine HP**	**VOC** lb/mile	**CO** lb/mile	**NOx** lb/mile	**SO_2** lb/mile	**PM_{10}** lb/mile	**$PM_{2.5}$** lb/mile	**CO_2** lb/mile
Dump Truck (12 CY)	12,367	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
			VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
		Light-duty Truck	18.81	99.46	446.08	0.22	18.61	18.03	42,525
		Subtotal (lbs):	19	99	446	0	19	18	42,525
Excavation Hauling Grand Total in Tons			**0.01**	**0.05**	**0.22**	**0.00**	**0.01**	**0.01**	
Excavation Hauling Grand Total in Metric Tons									**19**

Table 2.13 **Fugitive Dust Emissions**

Project	**PM_{10} tons/acre/mo**	**acres**	**days of disturbance**	**PM_{10} tons from general equipment movement**	**PM_{10} tons from cut/fill CY**	**PM_{10} Total**	**$PM_{2.5}$ / PM_{10} Ratio**	**$PM_{2.5}$ Total**
Project A	0.011	159.99	438	38.6	67.26	105.8	0.1	10.6
Project C	0.011	0.93	7	0.0	0.35	0.4	0.1	0.04
Project D	0.011	0.98	7	0.0	0.38	0.4	0.1	0.04
Project E	0.011	1.79	13	0.0	0.68	0.7	0.1	0.07
Project F	0.011	20.00	36	0.4	1.90	2.3	0.1	0.2
Annual						109.6		11.0

Table 2.14 **Total Emissions**

Year	**VOC** Tons	**CO** Tons	**NOx** Tons	**SO2** Tons	**PM10** Tons	**PM2.5** Tons	**CO_2** Metric Tons
Annual Short Term Emissions	0.37	1.94	8.35	0.01	109.93	11.31	1,243

TAB D. **Vehicle Assembly District Emissions**

Table 3.1 **Site Prep** 983,080 SF

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
Dozer	542	275	0.58	0.02	0.09	0.29	0.001	0.02	0.02	537
Loader/Backhoe	722	300	0.48	0.03	0.17	0.50	0.001	0.03	0.03	537
				VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
			Dozer	3.72	16.82	55.82	0.27	3.15	3.06	102,235
			Loader/Backhoe	7.94	38.02	113.83	0.34	7.06	6.85	123,057
			Subtotal in lbs	12	55	170	1	10	10	225,292
			Site Prep Total in Tons	**0.01**	**0.03**	**0.08**	**0.00**	**0.01**	**0.00**	
			Site Prep Total in Metric Tons							**102**

23 working days
8.75 Trips per day
20 miles per trip

Table 3.2 **Site Prep - Worker Trips**

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM_{10} lb/mile	$PM_{2.5}$ lb/mile	CO_2 lb/mile
Light-duty Truck	3,949	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
			VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
		Light-duty Truck	6.01	31.76	142.46	0.07	5.94	5.76	13,580
		Subtotal (lbs):	6	32	142	0	6	6	13,580
		Site Prep Worker Trips Grand Total in Tons	**0.00**	**0.02**	**0.07**	**0.00**	**0.00**	**0.00**	
		Site Prep Worker Trips Grand Total in Metric Tons							**6**

Table 3.3 **Grading** 47,269 CY

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
Dozer	432	275	0.58	0.02	0.09	0.29	0.001	0.02	0.02	537
Grader	432	145	0.58	0.02	0.13	0.46	0.001	0.03	0.03	537
Excavator	864	450	0.53	0.03	0.20	0.55	0.001	0.03	0.03	537
Compactor	864	105	1	0.06	0.26	0.86	0.001	0.06	0.06	537
Loader/Backhoe	864	300	0.48	0.03	0.17	0.50	0.001	0.03	0.03	537
				VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
			Dozer	2.97	13.42	44.53	0.22	2.52	2.44	81,550
			Grader	1.61	10.66	36.86	0.12	2.48	2.41	42,999
			Excavator	14.52	92.36	249.33	0.67	14.80	14.35	243,865
			Compactor	11.05	52.71	172.34	0.30	11.66	11.31	107,350
			Loader/Backhoe	9.50	45.49	136.20	0.40	8.44	8.19	147,238
			Subtotal in lbs	40	215	639	2	40	39	623,001
			Site Prep Total in Tons	**0.02**	**0.11**	**0.32**	**0.00**	**0.02**	**0.02**	
			Site Prep Total in Metric Tons							**283**

3,939 Truck trips
20 miles per trip

Table 3.4 **Grading - Hauling**

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM10 lb/mile	PM2.5 lb/mile	CO_2 lb/mile
Dump Truck (12 CY)	78,781	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
			VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
		Dump Truck (12 CY)	119.85	633.56	2,841.64	1.42	118.52	114.84	270,892
		Subtotal in lb:	120	634	2,842	1	119	115	270,892
		Demo Hauling Grand Total in Tons	**0.06**	**0.32**	**1.42**	**0.00**	**0.06**	**0.06**	
		Demo Hauling Grand Total in Metric Tons							**123**

54 working days
10 Trips per day

Table 3.5 **Grading - Worker Trips** 20 miles per trip

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM_{10} lb/mile	$PM_{2.5}$ lb/mile	CO_2 lb/mile
Light-duty Truck	10,801	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
			VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
		Light-duty Truck	16.43	86.86	389.60	0.19	16.25	15.75	37,141
		Subtotal (lbs):	16	87	390	0	16	16	37,141
Site Prep Worker Trips Grand Total in Tons			**0.01**	**0.04**	**0.19**	**0.00**	**0.01**	**0.01**	
Site Prep Worker Trips Grand Total in Metric Tons									**17**

Table 3.6 **Bldg. Const.** 618,914 SF

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
Crane	5,600	150	1	0.04	0.18	0.86	0.001	0.04	0.04	531
Forklift	19,200	74	0.48	0.05	0.20	2.55	0.002	0.02	0.02	596
Loader/Backhoe	16,800	300	0.48	0.03	0.17	0.50	0.001	0.03	0.03	537
Welder	5,600	10	0.19	1.17	5.27	4.76	0.003	0.61	0.59	693
Generator Set	6,400	264	0.43	0.21	0.67	2.57	0.002	0.13	0.13	530
				VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
			Crane	76.69	324.74	1,599.38	2.73	75.43	73.17	983,217
			Forklift	76.86	293.33	3,829.75	2.36	23.80	23.09	896,092
			Loader/Backhoe	184.66	884.41	2,648.03	7.85	164.16	159.23	2,862,623
			Welder	27.48	123.63	111.57	0.06	14.39	13.95	16,247
			Generator Set	343.33	1,076.22	4,118.27	2.71	213.91	207.49	849,597
			Subtotal in lbs	709	2702	12307	16	492	477	5,607,776
Site Prep Total in Tons				**0.35**	**1.35**	**6.15**	**0.01**	**0.25**	**0.24**	
Site Prep Total in Metric Tons										**2,544**

800 working days
260 Trips per day

Table 3.7 **Bldg. Constr. - Worker Trips** 20 miles per trip

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM_{10} lb/mile	$PM_{2.5}$ lb/mile	CO_2 lb/mile
Light-duty Truck	4,159,102	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
			VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
		Light-duty Truck	6327.34	33447.37	150019.02	75.05	6257.24	6062.96	14,301,243
		Subtotal (lbs):	6,327	33,447	150,019	75	6,257	6,063	14,301,243
Bldg. Constr. Worker Trips Grand Total in Tons			**3.16**	**16.72**	**75.01**	**0.04**	**3.13**	**3.03**	
Bldg. Constr. Worker Trips Grand Total in Metric Tons									**6,487**

800 working days
101 trips per day

Table 3.8 **Bldg. Constr. - Material Delivery** 20 miles per trip

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM_{10} lb/mile	$PM_{2.5}$ lb/mile	CO_2 lb/mile
Dump Truck (12 CY)	1,623,040	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
			VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
		Light-duty Truck	2469.17	13052.44	58543.14	29.29	2441.82	2366.00	5,580,890
		Subtotal (lbs):	2,469	13,052	58,543	29	2,442	2,366	5,580,890
Excavation Hauling Grand Total in Tons			**1.23**	**6.53**	**29.27**	**0.01**	**1.22**	**1.18**	
Excavation Hauling Grand Total in Metric Tons									**2,531**

Table 3.8 **Concrete Pav** 472,300 SF
454,184 CF

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr

Paver	3,795	164	0.58	0.06	0.27	0.87	1.50E-03	0.06	0.06	537
Roller	2,530	401	0.58	0.05	0.31	0.85	1.52E-03	0.04	0.04	537
Loader/Backhoe	1,265	300	0.48	0.03	0.17	0.50	0.001	0.03	0.03	536.73
Paving Equipment	1,265	60	0.58	0.11	0.70	2.83	0.002	0.08	0.08	595.83
				VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
			Paver	43.99	218.08	692.26	1.19	48.97	47.50	427,048
			Roller	60.21	396.07	1,107.58	1.97	55.33	53.67	696,153
			Loader/Backhoe	13.90	66.59	199.37	0.59	12.36	11.99	215,522
			Paving Equipment	10.83	67.79	275.02	0.16	7.77	7.54	57,819
			Subtotal in lbs	129	749	2274	4	124	121	1,396,542

On-road Equipment	Hours of Operation	Engine HP	Probability based Speed (miles/hour)	VOC lb/mile	CO lb/mile	NOx lb/mile	SO2 lb/mile	PM10 lb/mile	PM2.5 lb/mile	CO_2 lb/mile
Dump Truck	1,265	230	17	0.001521	0.008042	0.036070	1.80E-05	0.001504	0.001458	3.438541
Water Truck	1,265	230	10	0.001521	0.008042	0.036070	1.80E-05	0.001504	0.001458	3.438541
				VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
			Dump Truck	32.71	172.92	775.59	0.39	32.35	31.35	73,936.78
			Water Truck	19.24	101.72	456.23	0.23	19.03	18.44	43,492.23
			Concrete Paving Grand Total in Tons	**0.09**	**0.51**	**1.75**	**0.00**	**0.09**	**0.09**	
			Concrete Paving Grand Total in Metric Tons							**687**

158 working days
10 Trips per day
20 miles per trip

Table 3.9 **Paving - Worker Trips**

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM_{10} lb/mile	$PM_{2.5}$ lb/mile	CO_2 lb/mile
Light-duty Truck	31,621	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
			VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
			Light-duty Truck	48.11	254.30	1140.58	0.57	47.57	46.10	108,731
			Subtotal (lbs):	48	254	1,141	1	48	46	108,731
			Excavation Hauling Grand Total in Tons	**0.02**	**0.13**	**0.57**	**0.00**	**0.02**	**0.02**	
			Excavation Hauling Grand Total in Metric Tons							**49**

1,402 Truck Trips
20 miles per trip

Table 3.10 **Concrete Paving - Material Delivery**

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM_{10} lb/mile	$PM_{2.5}$ lb/mile	CO_2 lb/mile
Dump Truck (12 CY)	28,038	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
			VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
			Light-duty Truck	42.66	225.48	1011.34	0.51	42.18	40.87	96,411
			Subtotal (lbs):	43	225	1,011	1	42	41	96,411
			Excavation Hauling Grand Total in Tons	**0.02**	**0.11**	**0.51**	**0.00**	**0.02**	**0.02**	
			Excavation Hauling Grand Total in Metric Tons							**44**

Table 3.11 **Demolition** 2,334 SF

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
Excavator	240	450	0.53	0.03	0.20	0.55	0.001	0.03	0.03	537
Dozer	160	275	0.58	0.02	0.09	0.29	0.001	0.02	0.02	537
				VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
			Excavator	4.03	25.65	69.25	0.19	4.11	3.99	67,732
			Dozer	1.10	4.97	16.49	0.08	0.93	0.90	30,200
			Subtotal in lbs	5	31	86	0	5	5	97,932
			Site Prep Total in Tons	**0.00**	**0.02**	**0.04**	**0.00**	**0.00**	**0.00**	
			Site Prep Total in Metric Tons							**44**

33 Truck trips

Table 3.11 **Demolition - Hauling** 20 miles per trip

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM10 lb/mile	PM2.5 lb/mile	CO_2 lb/mile
Dump Truck (12 CY)	666	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
			VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
Dump Truck (12 CY)			1.01	5.35	24.01	0.01	1.00	0.97	2,289
Subtotal in lb:			1	5	24	0	1	1	2,289
Demo Hauling Grand Total in Tons			**0.00**	**0.00**	**0.01**	**0.00**	**0.00**	**0.00**	
Demo Hauling Grand Total in Metric Tons									**1**

10 working days

6.25 Trips per day

Table 3.12 **Demolition - Worker Trips** 20 miles per trip

On-road Equipment	Miles	Engine HP	VOC lb/mile	CO lb/mile	NOx lb/mile	SO_2 lb/mile	PM_{10} lb/mile	$PM_{2.5}$ lb/mile	CO_2 lb/mile
Light-duty Truck	1,250	230	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
			VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
Light-duty Truck			1.90	10.05	45.09	0.02	1.88	1.82	4,298
Subtotal (lbs):			2	10	45	0	2	2	4,298
Excavation Hauling Grand Total in Tons			**0.00**	**0.01**	**0.02**	**0.00**	**0.00**	**0.00**	
Excavation Hauling Grand Total in Metric Tons									**2**

Table 3.13 **Fugitive Dust Emissions**

Project	PM_{10} tons/acre/mo	acres	days of disturbance	PM_{10} from cut/fill CY	PM_{10} Total	$PM_{2.5}$ / PM_{10} Ratio	$PM_{2.5}$ Total
A	0.011	0.01	0	0.00	0.00	0.1	0.00
C	0.011	20.00	36	1.90	2.30	0.1	0.23
D	0.011	0.71	4	0.20	0.20	0.1	0.02
E	0.011	1.00	2	0.10	0.10	0.1	0.01
F	0.011	5.74	10	0.55	0.58	0.1	0.06
G	0.011	0.28	0	0.01	0.01	0.1	0.00
H	0.011	0.57	2	0.03	0.03	0.1	0.00
Annual					3.2		0.3

Table 3.14 **Total Emissions**

Year	VOC Tons	CO Tons	NOx Tons	SO2 Tons	PM10 Tons	PM2.5 Tons	CO_2 Metric Tons
Annual Short Term Emissions	1.00	5.18	23.09	0.01	4.18	1.26	2,584

Appendix D
Land Use Control Implementation Plans

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Table 1. Remediation Sites with LUCIPs Central Campus / Processing District	
Site ID / Name	**LUCIP Description**
SWMU #004: Orsino Yard Storage Facility	**Media Impacted:** Soil and Groundwater **Contaminants**: PAHs and PCBs (soil); VOCs (groundwater) **LUC Description**: Restrict groundwater use and prohibit residential use/exposure to site soils. **Located at or near Proposed Project?** Yes – Project K (Upgrade Orsino Substation)
SWMU #013: General Services Administration Vehicle Maintenance Facility	**Media Impacted:** Soil and Groundwater **Contaminants**: PAHs and metals (soil); VOCs (groundwater) **LUC Description**: Restrict groundwater use, prevent residential exposure to site soils, and ensure the swales remain in the current configuration while limiting human activity in the impacted areas. **Located at or near Proposed Project?** Yes – Project S (Demolish Facilities Programmed for Consolidated Maintenance Complex)
SWMU #014: Base Support Building (former Maintenance and Operations (M and O) Building)	**Media Impacted:** Soil / Dry Sediment and Groundwater **Contaminants**: PAHs, PCBs, and arsenic (soil / dry sediment); VOCs and iron (groundwater) **LUC Description**: Restrict groundwater use, prohibit residential use of the site, and ensure the swales at the site remain in the current configuration with human activity limited to periodic maintenance. **Located at or near Proposed Project?** Yes – Project S (Demolish Facilities Programmed for Consolidated Maintenance Complex)
SWMU #039: Building M7-505 Treatment Tank	**Media Impacted:** Soil and Groundwater **Contaminants:** VOCs, including TCE, cis-1,2-dichloroethene, and Vinyl Chloride (groundwater); PCBs (soil) **LUC Description**: Restrict groundwater use, prohibit industrial / residential access to soil. **Located at or near Proposed Project?** No
SWMU #045: Central Heat Plant	**Media Impacted:** Soil and Groundwater **Contaminants:** VOCs (groundwater); Nickel (soil) **LUC Description:** Restrict groundwater use, prohibit residential use of swale soils. **Located at or near Proposed Project?** Yes – Project R (Demolish Facilities Programmed for Consolidated Warehouse Facility)
SWMU #067: Paint and Oil Locker (POL) Area	**Media Impacted:** Soil and Groundwater **Contaminants:** VOCs and aluminum (groundwater); PCBs and benzo(a)pyrene (soil) **LUC Description:** Restrict groundwater use; prohibit residential exposure to site soils; restrict use of site soils and swale soils. **Located at or near Proposed Project?** Yes – Project R (Demolish Facilities Programmed for Consolidated Warehouse Facility)
SWMU #069: FIREX Water Tank	**Media Impacted:** Soil / Dry Sediment **Contaminants:** PAHs and arsenic **LUC Description:** Limit human activity; maintain current swale configuration. **Located at or near Proposed Project?** Yes – Project D (Construct Orion Clamshell)
SWMU #070: Hypergol Maintenance Facility (HMF) Hazardous Waste South Staging Areas	**Media Impacted:** Groundwater **Contaminants:** VOCs, Aluminum, and Iron **LUC Description:** Restrict groundwater use. **Located at or near Proposed Project?** Yes – Project D (Construct Orion Clamshell)
SWMU #076: Operations and Checkout Building	**Media Impacted:** Soil and Groundwater **Contaminants:** VOCs and Iron (groundwater); PCBs and PAHs (soil) **LUC Description:** Restrict groundwater use; prohibit residential exposure to surface soil. **Located at or near Proposed Project?** Yes – Project U (Repurpose O and C South Wing Labs)

Table 1. Remediation Sites with LUCIPs Central Campus / Processing District	
Site ID / Name	**LUCIP Description**
SWMU #077: Vertical Processing Facility	**Media Impacted:** Groundwater **Contaminants:** TCE, cis-1,2-dichloroethene, Vinyl Chloride **LUC Description:** Restrict groundwater use. **Located at or near Proposed Project?** No
SWMU #079: Environmental Health Facility	**Media Impacted:** Groundwater **Contaminants:** Vinyl Chloride **LUC Description:** Restrict groundwater use. **Located at or near Proposed Project?** No
SWMU #082: Communications, Maintenance, and Storage Facility	**Media Impacted:** Groundwater **Contaminants:** PCE, TCE, cis-1,2-dichloroethene, Vinyl Chloride, 1,1-Dichloroethene **LUC Description:** Restrict groundwater use. **Located at or near Proposed Project?** Yes - Project R (Demolish Facilities Programmed for Consolidated Warehouse Facility)
SWMU #084: Kennedy Athletic Recreation and Social (KARS) Park 1 – LOCs 2,7,9	**Media Impacted:** Groundwater **Contaminants:** 1,1'-Biphenyl (LOC 2); Arsenic (LOC 7); Lead (LOC 9). **LUC Description:** Restrict groundwater use. **Located at or near Proposed Project?** No
SWMU #085: Engineering Development Laboratory	**Media Impacted:** Groundwater **Contaminants:** Vinyl Chloride **LUC Description:** Restrict groundwater use. **Located at or near Proposed Project?** Yes – Project R (Demolish Facilities Programmed for Consolidated Warehouse Facility)
SWMU #088: Supply Warehouse No. 3	**Media Impacted:** Groundwater **Contaminants:** Chlorinated VOCs **LUC Description:** Restrict groundwater use. **Located at or near Proposed Project?** Yes – Project R (Demolish Facilities Programmed for Consolidated Warehouse Facility)
SWMU #090: Hypergol Maintenance Facility (HMF) North	**Media Impacted:** Soil and Groundwater **Contaminants:** VOCs and 1,4-dioxane (groundwater); PCBs (soil). **LUC Description:** Restrict groundwater use, prohibit industrial and residential future site uses, restrict human exposure to soils. **Located at or near Proposed Project?** Yes – Project R (Demolish Facilities Programmed for Consolidated Warehouse Facility)
SWMU #091: Launch Equipment Test Facility	**Media Impacted:** Groundwater **Contaminants:** Vinyl Chloride **LUC Description:** Restrict groundwater use. **Located at or near Proposed Project?** No
SWMU #092: Central Supply Warehouse	**Media Impacted:** Soil **Contaminants:** PCBs and PAHs **LUC Description:** Prohibit future residential use. **Located at or near Proposed Project?** Yes – Project R (Demolish Facilities Programmed for Consolidated Warehouse Facility)
SWMU #093: Citgo Service Station	**Media Impacted:** Groundwater **Contaminants:** Beneze, total xylenes, MTBE, naphthalene **LUC Description:** Restrict groundwater use. **Located at or near Proposed Project?** No
SWMU #095: GSA Seized Property	**Media Impacted:** Groundwater **Contaminants:** VOCs **LUC Description:** Restrict groundwater use. **Located at or near Proposed Project?** Yes – Project I (Replace CDC)

Table 1. Remediation Sites with LUCIPs Central Campus / Processing District	
Site ID / Name	**LUCIP Description**
SWMU #096: Orsino Power Substation	**Media Impacted:** Soil **Contaminants:** Barium, Copper, PCBs, TPH **LUC Description:** Prohibit residential use. **Located at or near Proposed Project?** Yes – Project K (Upgrade Orsino Substation)
SWMU #098: Space Station Processing Facility	**Media Impacted:** Groundwater **Contaminants:** Ammonia **LUC Description:** Restrict groundwater use. **Located at or near Proposed Project?** Yes – Project J (Outgrant/Divest/IOZ Space in SSPF)
SWMU #104: KSC Headquarters Building Area	**Media Impacted:** Soil and Concrete **Contaminants:** PCBs **LUC Description:** Prevent exposure to soil and concrete. **Located at or near Proposed Project?** Yes – Project E (Construct Applied Science and Technical Analysis Facility)
PRL #149: KSC Child Development Center	**Media Impacted:** Soils **Contaminants:** Arsenic **LUC Description:** Restrict exposure to subsurface soils; maintain existing impervious surfaces. **Located at or near Proposed Project?** Yes – Project I (Replace CDC)
PRL #150: Sewage Treatment Plant #1	**Media Impacted:** Soil **Contaminants:** PCBs **LUC Description:** Restrict residential use. **Located at or near Proposed Project?** Yes – Project R (Demolish Facilities Programmed for Consolidated Warehouse Facility); Project F (Repair/Upgrade Sewage Conveyance System)

Table 2. Remediation Sites with LUCIPs Exploration Launch District	
Site ID / Name	**LUCIP Description**
SWMU #008: Launch Complex 39A (LC-39A)	**Media Impacted:** Groundwater **Contaminants:** VOCs, including TCE, cis-1,2-dichloroethene, and Vinyl Chloride **LUC Description:** Restrict groundwater use. **Note**: SWMUs #046 through #051, each located in various areas of LC-39A, have been consolidated under SWMU #008. **Located at or near Proposed Project?** Yes – Project I (Add/Repair High-Pressure Gas Batteries)
SWMU #009: Launch Complex 39B (LC-39B)	**Media Impacted**: Soil and Groundwater **Contaminants**: Benzo(a)pyrene, PCBs, arsenic, nickel, and zinc (soil); VOCs, aluminum, arsenic, barium, lead, mercury, and thallium (groundwater) **LUC Description**: Restrict groundwater use; prohibit residential exposure to soil. **Note**: SWMUs numbers 032, 052, 053, 061, and 062, each located in various areas of LC-39B, have been consolidated under SWMU #009 **Located at or near Proposed Project?** No
SWMU #043: East Crawler Park Site	**Media Impacted:** Soil **Contaminants:** PCBs **LUC Description:** Restrict residential exposure. **Located at or near Proposed Project?** Yes – Project C (Replace Launch Complex (LC)-39 Area Duct Bank); Project E (Upgrade Stormwater Treatment Infrastructure)
SWMU #106: Fire Station #3	**Media Impacted:** Soil and Groundwater **Contaminants:** Vinyl Chloride (groundwater); PCBs (soil) **LUC Description:** Restrict groundwater use; prevent exposure to soil under active transformer. **Located at or near Proposed Project?** Yes – Project G (Improve Pad 39-B Bypass Road to Serve as Improved Access to Phillips Parkway); Project O (Construct Future Small-Class Vehicle Landing Site)
SWMU #107: Launch Complex Area 39 Observation Gantry Area	**Media Impacted:** Groundwater **Contaminants:** Vinyl Chloride **LUC Description:** Restrict groundwater use. **Located at or near Proposed Project?** Yes – Project C (Replace Launch Complex (LC)-39 Area Duct Bank); Project E (Upgrade Stormwater Treatment Infrastructure)
SWMU #111: Launch Complex 39A Operations Support Building Area	**Media Impacted:** Groundwater **Contaminants:** VOCs **LUC Description:** Restrict groundwater use. **Located at or near Proposed Project?** No

Table 3. Remediation Sites with LUCIPs Vehicle Assembly Building District	
Site ID / Name	LUCIP Description
SWMU #030: Component Cleaning Facility	**Media Impacted**: Groundwater **Contaminants**: VOCs and SVOCs **LUC Description**: Restrict groundwater use. **Located at or near Proposed Project?** Yes – Project G (Construct Supplemental Gaseous Nitrogen (GN_2) Pumping Site)
SWMU #037: Former Drum Storage Area	**Media Impacted**: Groundwater **Contaminants**: Chlorinated VOCs **LUC Description**: Restrict groundwater use, prevent future residential exposure to groundwater, and prevent potential discharge of contaminated groundwater to adjacent surface water bodies designated as Outstanding Florida Waters (OFW). **Located at or near Proposed Project?** No
SWMU #041: Components Refurbishment and Chemical Analysis Facility	**Media Impacted:** Soil and Groundwater **Contaminants:** VOCs (groundwater); PCBs (soil) **LUC Description:** Restrict groundwater use; Prevent residential use access (soil). **Located at or near Proposed Project?** Yes – Project M (Upgrade/Expand State Road 3)
SWMU #044: West Crawler Park Site	**Media Impacted:** Groundwater **Contaminants:** Vinyl Chloride **LUC Description:** Restrict groundwater use. **Located at or near Proposed Project?** Yes – Project J (Mitigate Climate Change – Critical Facility Flood Fortification)
SWMU #055: Contractors Road Heavy Equipment Area	**Media Impacted:** Groundwater **Contaminants:** VOCs **LUC Description:** Restrict groundwater use. **Note:** SWMUs numbers 015, 016, 031, each located in various areas near Contractors Road, have been consolidated under SWMU #055. **Located at or near Proposed Project?** Yes – Project L (Construct Centralized Maintenance Complex); Project K (Construct Centralized Warehouse)
SWMU #056: Mobile Launch Platform (MLP) Park Sites/Vehicle Assembly Building (VAB) Area	**Media Impacted:** Soil and Groundwater **Contaminants:** VOCs (groundwater); PCBs (soil) **LUC Description:** Restrict groundwater use; restrict residential / industrial exposure to soils. **Located at or near Proposed Project?** Yes - Project F (Modify and Stabilize Roadway to Mitigate Climate Impact); Project H (Construct New Press Site); Project I (Renovate Launch Support Equipment); Project J (Mitigate Climate Change – Critical Facility Flood Fortification); Project N (Outgrant/Demolish Operational Support Building 1)
SWMU #081: Shuttle Flight Operation Contract (SFOC) Generator Maintenance Facility	**Media Impacted:** Groundwater **Contaminants: A**ntimony **LUC Description:** Restrict groundwater use. **Located at or near Proposed Project?** Yes – Demolish Facilities Programmed for Consolidated Warehouse Facility and/or Maintenance Complex; Existing roadway to be improved as an access road to the proposed Payload Processing Facility (Project C).

Table 3. Remediation Sites with LUCIPs Vehicle Assembly Building District	
SWMU #089: Converter/Compressor Building	**Media Impacted:** Groundwater **Contaminants:** VOCs **LUC Description:** Restrict groundwater use. **Located at or near Proposed Project?** Yes – Project B (Upgrade Converter Compressor Facility [CCF]); Project G (Construct Supplemental Gaseous Nitrogen (GN_2) Pumping Site)
SWMU #100: Area South of Building K7-0516	**Media Impacted:** Groundwater **Contaminants:** VOCs **LUC Description:** Restrict groundwater use, prevent discharge to adjacent surface water bodies. **Located at or near Proposed Project?** Yes – Project G (Construct Supplemental Gaseous Nitrogen (GN_2) Pumping Site)
SWMU #102: Propellants Storage Building Area	**Media Impacted:** Groundwater **Contaminants:** VOCs **LUC Description:** Restrict groundwater use, prohibit future use. **Located at or near Proposed Project?** No
SWMU #108: Mission Support Building Area	**Media Impacted:** Groundwater **Contaminants:** Vinyl Chloride **LUC Description:** Restrict groundwater use. **Located at or near Proposed Project?** No
PRL #051: Launch Equipment Shop	**Media Impacted:** Groundwater **Contaminants:** PAHs and TPH **LUC Description:** Restrict groundwater use, prevent future risks. **Located at or near Proposed Project?** No

Source: NASA KSC Land Use Control Inspections Report, 2024d

Legend: MTBE = Methyl tert-butyl ether; PAHs = Polynuclear Aromatic Hydrocarbons; PCBs = Polychlorinated Biphenyls; PCE = tetrachloroethene (or perchloroethylene); PRL = Potential Release Location; SVOCs = Semi-Volatile Organic Compounds; SWMU = Solid Waste Management Unit; TCE = trichloroethene; TPH = Total Petroleum Hydrocarbons; VOCs = Volatile Organic Compounds