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Draft Environmental Assessment for the Construction of Solar Photovoltaic Facilities at the John F. Kennedy Space Center, Kennedy Space Center, Florida

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National Aeronautics and Space Administration
John F. Kennedy Space Center
Kennedy Space Center, Florida

Prepared for:
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Construction of Solar Photovoltaic Facilities at the John F. Kennedy Space Center

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Environmental Assessment

Construction of Solar Photovoltaic Facilities at the John F. Kennedy Space Center, Kennedy Space Center, Florida

Environmental Assessment for the Construction of Solar Photovoltaic Facilities at John F. Kennedy Space Center Kennedy Space Center, Merritt Island, Brevard County, Florida

Lead Agency: National Aeronautics and Space Administration
John F. Kennedy Space Center

Proposed Action: Florida Power & Light Company (FPL) proposes to develop a 74.5 megawatt (MW) solar photovoltaic (PV) facility on National Aeronautics and Space Administration's (NASA) property at the Kennedy Space Center (KSC) on Merritt Island, Brevard County, Florida. In addition, FPL proposes to develop a number of smaller solar installations (ground mount as well as canopies) at up to 12 additional In-Kind sites.

For Further Information: Donald Dankert, Environmental Management Branch, SI-E3, Kennedy Space Center, FL 328992016

Date: 2018

Abstract: FPL proposes to construct a 74.5 MW solar PV facility on NASA-KSC property in Brevard County, Florida. Typically, a 74.5 MW solar facility requires 400 to 600 acres (162 to 243 hectares [ha]) to ensure the facility can be designed to avoid and minimize wetland impacts to the greatest extent practicable. A 702-acre (284 ha) area (referred to as the Primary site) on NASA-KSC property has been evaluated in this Environmental Assessment (EA) to allow for engineering flexibility. The power generated from this facility would feed into FPL's general power supply and would be available to FPL's customers. The operation of the 74.5 MW facility could potentially reduce approximately 113,785 tons of carbon dioxide (CO_2) emissions annually (FPL, 2018), which is equivalent of removing 22,104 cars off the road for one year, that otherwise would have been generated from a fossil fuel-fired power plant.

In addition, FPL proposes to construct a number of smaller distributed generation solar installations (ground mount as well as canopies) at up to 12 additional sites (referred to as In-Kind sites or projects). Power generated at the In-Kind sites would be used by NASA-KSC to reduce their dependency on non-renewable energy sources.

Resources that may be impacted by the Proposed Action include land use, noise, biological resources, cultural resources, air, climate, hazardous waste and materials, water resources, soils, transportation, utilities, socioeconomics, and environmental justice. All potential impacts are anticipated to be negligible or minor in nature.

EXECUTIVE SUMMARY

This Environmental Assessment (EA) has been prepared in accordance with the National Environmental Policy Act of 1969 (NEPA), the Council on Environmental Quality (CEQ) regulations for implementing NEPA, the National Aeronautics and Space Administration's (NASA's) regulations for implementing NEPA, the NASA Procedural Requirements for Implementing NEPA, Executive Order (EO) 12114 "Environmental Effects Abroad of Major Federal Actions," and as identified in Section 1102 of the NASA Authorization Act of 2010. Section 106 of the National Historic Preservation Act (NHPA) and Section 7 of the Endangered Species Act (ESA) are also integrated with the NEPA process, to identify and protect cultural resources and threatened and endangered (T&E) species, respectively.

Much of the research for this EA was previously addressed at a programmatic level in the 2016 Center-Wide Operations Final Programmatic Environmental Impact Statement ("PEIS," NASA, 2016) and information in this EA has been tiered for the subject parcels. This data is incorporated into the discussions to this EA and the conclusion statements show the subject parcels' current status. This will serve to expedite the environmental review process and facilitate project approval, funding, and implementation.

Purpose and Need

Florida Power & Light Company's (FPL) purpose is to build and operate a 74.5 megawatt (MW) solar photovoltaic (PV) facility at NASA- Kennedy Space Center (KSC) that will maximize the use of existing infrastructure and assist NASA-KSC with their goal to increase on-site generation of renewable energy.

The project is needed to augment and diversify FPL's power generation portfolio. FPL is the largest electric utility in Florida, serving an estimated 10 million people (approximately 4.9 million customer accounts) across nearly half of the State of Florida. As mandated by the Public Service Commission, FPL must provide adequate and reliable electric service to all customers in its service territory. FPL seeks to utilize renewable energy resources to diversify its power generation portfolio and reduce emissions of greenhouse gases.

NASA-KSC is subject to federal EO 13221 "Energy Efficient Standby Power Devices," and EO 13834 "Efficient Federal Operations." Energy management and conservation are part of the environmental stewardship practices that NASA-KSC currently employs. Pertinent to the Proposed Action, NASA energy goals contained within their Five-Year Sustainability Plan (2016 – 2020) include the following:

- Reduce greenhouse gas (GHG) emissions
- Leverage clean and renewable energy
- Reduce Center costs

As part of their Renewable Energy program and Approved Center Master Plan (CMP), NASA-KSC plans to continue applying renewable energy technologies where they are life-cycle cost-effective. Current installations include solar PV for applications remote from the electric grid, such as perimeter fence security lighting, security intrusion detection, and hazardous warning sign and gate operation. Similarly, a 5-kilowatt PV system was installed at the NASA-KSC landfill in 2005 and a 10 MW solar facility in 2009. Through the CMP, NASA-KSC proposes over 1,000 acres (405 ha) dedicated to the construction of renewable energy projects (NASA, 2016).

Proposed Action and Alternatives

Proposed Action: FPL proposes to construct a 74.5 MW solar photovoltaic (PV) facility on NASA's property at the Kennedy Space Center (KSC) on Merritt Island, Brevard County, Florida (Figure 2-1). Typically, a 74.5 MW solar facility requires 400 to 600 acres (162 to 243 ha) to ensure the facility can be designed to avoid and minimize wetland impacts to the greatest extent practicable. A 702-acre (284 ha) area (Primary site) on NASA-KSC has been evaluated to allow engineering flexibility. The power generated from this facility would feed into FPL's general power supply and would be available to FPL's customers. The operation of the 74.5 MW facility could potentially reduce approximately 113,785 tons of CO2 emissions annually (FPL, 2018), which is equivalent of removing 22,104 cars off the road for each year, that otherwise would have been generated from a fossil fuel-fired power plant.

In addition, FPL proposes to construct a number of smaller distributed generation solar installations (ground mount as well as canopies) at up to 12 additional sites (referred to as In-Kind sites or projects). Power generated at the In-Kind sites would be used by NASA-KSC to reduce their dependency on non-renewable energy sources.

No action Alternative: Under the No-Action Alternative, the PV facilities would not be constructed on NASA-KSC property and the production of renewable solar energy would not occur.

Affected Environment and Consequences

The following environmental resources, discussed in detail in Section 3, have been identified as having the potential to be impacted by the implementation of the Proposed Action: land use, noise, biological resources, cultural resources, air, climate, hazardous waste and materials, water resources, soils, transportation, utilities, socioeconomics, and environmental justice. All potential impacts are anticipated to be negligible or minor in nature. Table ES-1 summarizes these impacts, which are discussed in detail in Section 3.

The past, present, and reasonably foreseeable future actions at NASA-KSC, Cape Canaveral Airforce Station (CCAFS), and Port Canaveral focus on constructing facilities and improving transportation modes, spacecraft processing and launch, the cruise and cargo industry, and their cumulative impacts. The Proposed Action combined with current and future actions would result in minor cumulative effects to biological and coastal resources and negligible cumulative effects to the other resources evaluated in this EA.

Agency and Public Consultation

The following entities have been consulted in preparation of this EA. Section 5 provides points of contact and address information:

- United States Fish and Wildlife Service (USFWS)
- Merritt Island National Wildlife Refuge (MINWR)
- United States Army Corps of Engineers (USACE)
- Florida State Clearing House
- Florida Department of Environmental Protection (FDEP)
- Florida State Historic Preservation Office (FSHPO)
- Florida Fish and Wildlife Conservation Commission (FFWCC)

- St. Johns River Water Management District (SJRWMD)
- Brevard County; and
- City of Titusville, Florida.

Table ES-1. Summary of Potential Impacts to Affected Environmental Resources				
Resource	**Primary Site**	**Undeveloped In-Kind Sites 6, 10, 11, and 12**	**Developed In-Kind Sites 1, 2, 3, 4, 5,7, 8, and 9**	**No-Action Alterative**
Land Use	Minor, short-term and long-term	No effect	Minor, short-term – all; minor (beneficial), long-term: 2, 3, 4, 7, and 9; minor long-term: 1, 4, and 8	No effect
Visual	Minor, short-term; minor (beneficial) long-term	Negligible short and long-term	Negligible short and long-term	No effect
Coastal Zone	Minor, short and long-term	Minor, short and long-term	No effect	No effect
Noise	Minor, short-term; negligible long-term	Minor, short-term; negligible long-term	Minor, short-term; negligible long-term	No effect
Vegetation and Habitats	Minor, short and long-term	Minor, short and long-term	No effect	No effect
Wetlands	Minor, short and long-term	Minor, short and long-term	No effect	No effect
Wildlife	Minor, short and long-term	Minor, short and long-term	No effect	No effect
Protected Species	Minor, short and long-term	Minor, short and long-term	No effect	No effect
Cultural Resources	No effect	No effect	No effect	No effect
Air	Minor, short-term; minor (beneficial) long-term	Minor, short-term; minor (beneficial) long-term	Minor, short-term; minor (beneficial) long-term	No effect
Climate	Minor (beneficial), long-term	Minor (beneficial), long-term	Minor (beneficial), long-term	No effect
Hazardous Materials and Waste	Minor, short and long-term	Minor, short and long-term	Minor, short and long-term	No effect
Surface Water	Minor, short and long-term	Minor, short and long-term	No effect	No effect
Floodplains	Minor, short and long-term	No effect	No effect	No effect
Ground Water	Negligible short and long-term	Negligible short and long-term	No effect	No effect
Geology	No effect	No effect	No effect	No effect
Soils	Minor, short and long-term	Minor, short and long-term	No effect	No effect
Transportation	Negligible, short and long-term	Negligible, short and long-term	Negligible, short and long-term	No effect

Table ES-1. Summary of Potential Impacts to Affected Environmental Resources				
Resource	Primary Site	Undeveloped In-Kind Sites 6, 10, 11, and 12	Developed In-Kind Sites 1, 2, 3, 4, 5,7, 8, and 9	No-Action Alterative
Drinking Water	No effect	No effect	No effect	No effect
Wastewater	No effect	No effect	No effect	No effect
Stormwater	Minor short-term; negligible long-term	Minor short-term; negligible long-term	No effect	No effect
Electricity	Minor (beneficial) long-term	Minor (beneficial) long-term	Minor (beneficial) long-term	No effect
Public Health and Safety	Negligible short-term; minor (beneficial) long-term	Negligible short-term; minor (beneficial) long-term	Negligible short-term; minor (beneficial) long-term	No effect
Socioeconomics	Minor (beneficial), short-term; negligible (beneficial), long-term	Minor (beneficial), short-term; negligible (beneficial), long-term	Minor (beneficial), short-term; negligible (beneficial), long-term	No effect
Environmental Justice	No effect	No effect	No effect	No effect

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ACRONYMS AND ABBREVIATIONS

AC°-	alternating current
BMP-	best management practice(s)
CCAFS-	Cape Canaveral Airforce Station
CEQ -	Council on Environmental Quality
cm-	centimeter
CMP -	Center Master Plan
CO -	carbon monoxide
CO_2 -	carbon dioxide
CO_2e	carbon dioxide equivalent
CZMA -	Coastal Zone Management Act
dBA-	decibel(s)
DC -	Direct current
EA -	Environmental Assessment
EO -	Executive Order
EPA-	Environmental Protection Agency
ERP-	Environmental Resource Permit
ESA -	Endangered Species Act
FDEP -	Florida Department of Environmental Protection
FEMA-	Federal Emergency Management Agency
FFWCC -	Florida Fish and Wildlife Conservation Commission
FLUCFCS -	Florida Land Use, Cover and Forms Classification System
FLUP-	Future Land Use Plan
FPL -	Florida Power & Light Company
FSHPO -	Florida State Historic Preservation Office
ft-	feet
gal-	gallon
GHG-	greenhouse gas
GSDO-	Ground Systems Deployment Operations
ha -	hectare(s)
HAP-	hazardous air pollutant
in-	inch(s)
km-	kilometer(s)
KNPD -	Kennedy NASA Policy Directive
KSC -	Kennedy Space Center
l-	liter
LC-	Launch Complex
m-	meter
MINWR -	Merritt Island National Wildlife Refuge
MW -	megawatt(s)
MWD-	moderately well drained
NASA -	National Aeronautics and Space Administration
NEPA -	National Environmental Policy Act
NFA-	No Further Action
NFHL -	National Flood Hazard Layer

NHPA -	National Historic Preservation Act
NOA -	Notice of Availability
NOAA-	National Oceanic and Atmospheric Agency
NO_X -	nitrogen oxides
NPDES-	National Pollutant Discharge Elimination System
NRCS-	Natural Resources Conservation Service
NRHP-	National Register of Historic Places
OSHA-	Occupational Safety and Heath Administration
PD-	poorly drained
PEIS -	Programmatic Environmental Impact Statement
PM -	particulate matter
$PM_{2.5}$ -	particulate matter of less than 2.5 microns
PM_{10} -	particulate matter of 10 microns or less
PRL-	Potential Release Location
PV -	photovoltaic
RCRA-	Resource Conservation Recovery Act
SCS-	Soil Conservation Service
SJRWMD -	St. Johns River Water Management District
SLS-	Space Launch System
SO_2 -	sulfur dioxide
SPCC-	Spill Prevention Countermeasure Control Plan
SR -	state road
SSC-	Species of Special Concern
STP-	sewage treatment plant
SWMU-	Solid Waste Management Unit
SWPPP-	stormwater pollution prevention plan
T&E -	threatened and endangered
USACE -	United States Army Corps of Engineers
USAF-	United States Air Force
USDA -	United States Department of Agriculture
USGS-	United States Geological Survey
USFWS -	U.S. Fish and Wildlife Service
VAB-	Vehicle Assembly Building
VOC -	volatile organic compound
VPD-	very poorly drained

1.0 INTRODUCTION

1.1 Background

This Environmental Assessment (EA) has been prepared in accordance with the National Environmental Policy Act of 1969 (NEPA), the Council on Environmental Quality (CEQ) regulations for implementing NEPA, the National Aeronautics and Space Administration's (NASA's) regulations for implementing NEPA, the NASA Procedural Requirements for Implementing NEPA, Executive Order (EO) 12114, and Section 1102 of the NASA Authorization Act of 2010. Section 106 of the National Historic Preservation Act (NHPA) and Section 7 of the Endangered Species Act (ESA) are also integrated with the NEPA process, to identify and protect cultural resources and threatened and endangered (T&E) species, respectively (NASA, 2016).

NASA-Kennedy Space Center's (NASA-KSC's) 2013 Center Master Plan (CMP) Update provides a framework to transition NASA-KSC from a government-only launch complex to a multi-user spaceport. As part of this transition, NASA-KSC issued a Notice of Availability (NOA), in June 2016, seeking proposals for land development opportunities, including renewable energy development. Florida Power & Light Company (FPL) responded to the NOA with a proposal to construct a 74.5 megawatt (MW) solar photovoltaic (PV) facility at NASA-KSC. NASA-KSC and FPL are currently negotiating an Enhanced Use Lease to utilize NASA-KSC property to construct the project. Additionally, FPL and NASA-KSC are evaluating 12 In-Kind distributed generation solar installations that would provide additional renewable energy to NASA-KSC.

The EA has been prepared in order to evaluate the potential environmental impacts from construction and operation of the 74.5 MW solar PV facility as well as the 12 In-Kind projects. The EA has been tiered from the NASA-KSC CMP Final Programmatic Environmental Impact Statement (PEIS) (NASA, 2016). The EA incorporates discussion from the PEIS for reference and focuses on the issues specific to this proposal.

1.2 Purpose and Need for Proposed Action

1.2.1 Florida Power & Light Company

FPL's purpose is to build and operate a 74.5 MW solar PV facility at NASA-KSC that will maximize the use of existing infrastructure and assist NASA-KSC with their goal to increase on-site generation of renewable energy. The project is needed to augment and diversify FPL's power generation portfolio. FPL is the largest electric utility in Florida, serving an estimated 10 million people (approximately 4.9 million customer accounts) across nearly half of the State of Florida. As mandated by the Public Service Commission, FPL must provide adequate and reliable electric service to all customers in its service territory. FPL seeks to utilize renewable energy resources to diversify its power generation portfolio and reduce emissions of greenhouse gases.

1.2.2 Kennedy Space Center

NASA-KSC is subject to federal EO 13221 "Energy Efficient Standby Power Devices," and EO 13834 "Efficient Federal Operations." Energy management and conservation are part of the environmental stewardship practices that NASA-KSC currently employs. Pertinent to the Proposed Action, NASA energy goals contained within their Five-Year Sustainability Plan (2016 – 2020) include the following:

- Reduce greenhouse gas (GHG) emissions
- Leverage clean and renewable energy
- Reduce Center costs

As part of their Renewable Energy program and Approved CMP, NASA-KSC plans to continue applying renewable energy technologies where they are life cycle cost-effective. Through the CMP, NASA-KSC proposes over 1,000 acres (405 ha) dedicated to the construction of renewable energy projects (NASA, 2016). Current installations include:

- 10 MW FPL Solar Site
- 3 MW Central Campus Solar Site
- 1 MW NASA-KSC In-Kind Solar Site
- 84 KW Propellants North Rooftop Solar Site
- Small miscellaneous solar sites at remote locations

1.3 Agency Coordination and Public Involvement

Public involvement for this EA includes the dissemination of the Draft EA to federal, state, and local agencies and interested parties that may want to review the environmental documentation associated with this project. Through this dissemination, comments from these entities will be solicited through a 30-day comment period beginning on , 2018 and ending on , 2018. A list of the agencies participating in this process is provided in Section 5.

The following entities have been consulted in preparation of this EA. Section 5 provides points of contact and address information:

- United States Fish and Wildlife Service (USFWS)
- United States Army Corps of Engineers (USACE)
- Florida State Clearing House
- Florida Department of Environmental Protection (FDEP)
- Florida State Historic Preservation Office (FSHPO)
- Florida Fish and Wildlife Conservation Commission (FFWCC)
- St. Johns River Water Management District (SJRWMD)
- Brevard County, and
- City of Titusville, Florida.

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

This section describes the Proposed Action and No-Action Alternative. NASA-KSC implemented an internal selection process using pertinent evaluation criteria in order to identify the site locations that would be evaluated in this EA. These site locations were selected in order to minimize environmental impacts due to the existing disturbed nature of each, and their proximity to existing developed and industrialized areas on NASA-KSC where necessary infrastructure already exists.

2.1 Description of the Proposed Action

FPL proposes to construct a 74.5 MW solar PV facility on NASA-KSC property on Merritt Island, Brevard County, Florida. Typically, a 74.5 MW solar facility requires 400 to 600 acres (162 to 243 hectares [ha]) to ensure the facility can be designed to avoid and minimize wetland impacts to the greatest extent practicable. A 702-acre (284 ha) area (referred to as the Primary site) has been evaluated in this EA to allow for engineering flexibility. The power generated from this facility would feed into FPL's general power supply and would be available to FPL's customers. Operation of the 74.5 MW facility could potentially reduce approximately 113,785 tons of carbon dioxide (CO_2) emissions annually (FPL, 2018), which is equivalent of removing 22,104 cars off the road for one year, that otherwise would have been generated from a fossil fuel-fired power plant (Appendix A).

In addition, FPL proposes to construct a number of smaller distributed generation solar installations (ground mount as well as canopies) at up to 12 additional sites (referred to as In-Kind sites or projects). Power generated at the In-Kind sites would be used by NASA-KSC to reduce their dependency on non-renewable energy sources. T A location map identifying the Primary site and 12 In-Kind sites is provided as Figure 2-1.

2.1.1 The 74.5 MW Solar PV Facility

FPL proposes to construct and operate a ground-mounted solar PV facility that would produce 74.5 MW of power on the Primary site, which is depicted on a recent aerial photograph in Figure 2-2. The Primary site is located northwest of the intersection of NASA Parkway West (State Road [SR] 405) and Kennedy Parkway North (SR 3). A large portion of the site was formerly used for citrus production; operations ceased in 2008 and the citrus groves are currently overgrown with invasive exotic species. Portions of the Primary site not used for citrus production are a mix of undeveloped forested wetlands and uplands. Man-made ditches are interspersed throughout the Primary site.

The facility will consist of fixed solar PV panels with inverters, transformers, at-grade access paths, a substation, and security fencing. The primary access road to the site will be Roberts Road off of Kennedy Parkway North (SR 3). The PV panels will be mounted on a racking system that is supported by driven posts that are directly embedded in the ground. Concrete support footings are not required. The arrays are typically two feet off the ground and seven feet high. Direct current (DC) electrical energy is collected and converted to alternating current (AC) by the inverters. The AC current is then routed to the facility's substation by the AC collection system, a network of either overhead or buried cables. At the substation, the voltage is increased to match the voltage of the connecting transmission line. The facility will be connected to an existing FPL transmission line, which runs adjacent to the property along the north side of NASA Parkway West (SR 405). Figure 2-3 depicts the proposed solar facility layout on the Primary site.

Construction on the Primary site is expected to last approximately six to ten months. The staging area for the assembly of the PV panels would be located on-site. In addition, a small office trailer may be located on the site. Solid waste generated during the construction phase would be removed by the contractor(s) and disposed of at an appropriate disposal location. No routine maintenance activities requiring water for rinsing of panels is planned. All applicable permits will be obtained prior to construction activities. These permits are likely to include a Section 404 permit from the U.S. Army Corps of Engineers (USACE), Environmental Resource Permit (ERP) from the FL Department of Environmental Protection (FDEP), a National Pollutant Discharge Elimination System (NPDES) permit to discharge construction stormwater from the FDEP.

2.1.2 In-Kind Solar PV Facilities

In addition to the 74.5 MW solar PV facility discussed in Section 2.1.1, FPL proposes to construct a number of distributed generation (i.e. In-Kind) solar PV facilities on up to 12 sites totaling approximately 165.5 acres (67 ha) of NASA-KSC property. Table 2-1 identifies the size of each site and type of solar facility contemplated for development. The exact number and configuration of these facilities is yet to be finalized. All power generated from these facilities would feed directly into NASA-KSC's power supply; as a result, NASA-KSC would be the only recipient of the benefits associated with the on-site renewable energy generation. All components and routine maintenance procedures of this facility would be the same as discussed previously for the approximately 74.5 MW facility, but on a smaller scale. All applicable permits will be obtained prior to construction activities. Permits would be the same as required for the Primary site, including include a Section 404 permit from the USACE, ERP from the FDEP, and a NPDES permit to discharge construction stormwater from the FDEP.

Table 2-1. Description of Proposed In-Kind Sites

In-Kind Site Number	Name	Description	Proposed PV System	Size (acres)	Size (ha)
1	OPF 1&2 South Parking Lot	Paved parking lot	Ground	2.23	0.90
2	GSA Vehicle lot	Paved parking lot	Canopy	1.04	0.42
3	Vehicle Assembly Parking lot	Paved parking lot	Canopy	3.37	1.36
4	South OSB 2 lot	Paved parking lot	Canopy	3.18	1.29
5	South OSB 2 lot	Paved parking lot	Ground	0.40	0.16
6	Schwartz Rd	Undeveloped	Ground	49.43	20.00
7	Central Campus Phase 1	Paved parking lot	Canopy	3.10	1.25
8	Headquarters Central Surface Lot	Paved parking lot	Ground	4.47	1.81
9	Headquarters East Surface Lot	Paved parking lot	Canopy	3.98	1.61
10	MP Orsino South Expansion	Undeveloped	Ground	28.94	11.71
11	South SR 3 Option 2	Undeveloped	Ground	17.50	7.08
12	Phase 2 of KCA4204	Undeveloped	Ground	47.88	19.38
			Total	**165.51**	**66.98**

2.2 No-Action Alternative

Under the No-Action Alternative, the PV facilities would not be constructed on NASA-KSC property and the production of renewable solar energy would not occur. The costs associated with the creation of non-renewable energy would continue to increase. Lessons on solar power energy would not be learned that could be applied to larger-scale projects in the future. Dependence on foreign fuels for energy production would not be reduced. If the No-Action Alternative were implemented, GHG emissions would not be reduced because the proposed solar PV facilities would not be constructed.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section describes the natural, physical, and human resources that may be potentially affected by the Proposed Action, followed by the potential environmental consequences of the Proposed Action. Resources used to characterize the affected environment include NASA-KSC environmental documents and field visits of the Primary and 12 In-Kind site locations conducted by TRC scientists in April, May, and June 2018. NASA-KSC documents reviewed for this EA include KSC's Environmental Resources Document (ERD) (NASA, 2015a), which provides a detailed description of environment resources at NASA-KSC; Environmental Baseline Survey (EBS) FPL Solar Site KSC, FL (NASA, 2017), which provides a baseline description of the Primary site; KSC PEIS (NASA 2016), and the CMP (2015b).

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

An evaluation of potential consequences is based on analysis included in the PEIS (NASA, 2016) and professional judgement of the preparers. A summary of the factors used to evaluate environmental consequences is provided as Table 3-1.

Table 3-1. Factors Used to Characterize Environmental Consequences of the Proposed Action and No Action Alternatives

Factor	Definition
Type	• **Beneficial** – positive effect to the resource • **Adverse** – undesirable or negative effect to the resource • **Direct** – effect caused at the same time and place as action • **Indirect** – effect caused later in time or at a farther distance from action, but is still reasonably foreseeable • **Cumulative** – effect caused from incremental impact of the proposed action when added to past, present, and reasonably foreseeable future actions
Duration	• **Long Term** – effect would last longer than two years and is not related to specific phase (e.g. construction) • **Short Term** – effect would occur for a limited time frame (e.g. during construction only)
Extent	• **Large** – effect would occur over a large region, well past project site • **Medium/Localized** – effect would be limited to project site • **Small or Limited** – effect would be limited to a fraction of the project site
Magnitude	• **Major** – substantial effect or change that is easily defined, noticeable, and measurable, or exceeds a standard • **Moderate** – noticeable change in resource occurs, but the integrity of resource stays intact • **Minor** – change in resource occurs, but effect is unsubstantial

Table 3-1. Factors Used to Characterize Environmental Consequences of the Proposed Action and No Action Alternatives	
Factor	**Definition**
	• **Negligible** – effect is at lowest level of detection, is barely measurable and has no perceptible consequences • **None** – no measurable consequences
Likelihood	• **Probable** – more likely to occur than not • **Possible** – some chance of occurring but less than 50 percent • **Unlikely** – very low chance of occurrence

3.1 Land Use and Visual Resources

3.1.1 Affected Environment

3.1.1.1 Land Use

NASA-KSC is in the process of transforming from a single government user launch complex to a multi-user spaceport. The CMP outlines a development framework that would support the growth of the multi-user spaceport model and provides overall land management guidance for NASA-KSC from 2016 to 2032. A component of the CMP is a Future Land Use Plan (FLUP) that is the basis of the planning framework supporting continuing NASA Programs and future non-NASA opportunities. The FLUP outlines where development can occur, how land can be used, and how strategic capabilities can be expanded to support NASA-KSC's evolution to a multi-user spaceport. The FLUP includes 17 future land use categories that describe the types of operational or support activities planned to occur at NASA-KSC. The CMP Future Land Use Map defines the locations on KSC where each land use category is designated (NASA, 2016). Table 3-2 identifies the 17 land use designations and their proposed acreage on NASA-KSC by 2032. The Primary site and In-Kind sites are identified in the table according to each site's land use designation(s).

Table 3-2. Future Land Use Designations of KSC, Including the Primary Site and 12 In-Kind Sites

Land Use Designation	Future Acreage	Proposed Action Site
Administration	40.72	In-Kind sites 3, 4, 5, and 7
Assembly, Testing and Processing	1,894.77	In-Kind site 1
Central Campus	138.75	
Horizontal Launch and Landing	1,806.62	
Launch Operations and Support	491.59	
Operational Buffer/Conservation	41,297.17	Primary site
Operational Buffer/Public Use	34,824.72	
Public Outreach	522.13	
Recreation	161.36	
Renewable Energy	1,109.85	Primary site; In-Kind sites 6, 10, 11, and 12
Research and Development	867.49	In-Kind sites 8 and 9
Seaport	30.92	
Support Services	471.40	

Table 3-2. Future Land Use Designations of KSC, Including the Primary Site and 12 In-Kind Sites		
Land Use Designation	**Future Acreage**	**Proposed Action Site**
Utility Systems	1,329.60	In-Kind site 2
Vertical Launch	728.08	
Vertical Landing	40.56	
Water	55,541.81	
Total	**141,297.54**	

Source: CMP (NASA, 2016)

Per the CMP Future Land Use Map (NASA, 2016), the Primary site and In-Kind sites 6, 10, 11 and 12 are proposed to be located in areas designated as Renewable Energy. The other In-Kind sites are located on parking lots or grassy fields in areas with land use designations of Administration, Utility Systems, Assembly Testing and Processing, or Research and Development.

The Primary site is located on land designated for Renewable Energy and Operational Buffer/Conservation. Renewable Energy areas are designated to accommodate varying forms of renewable energy, including solar array fields. Operational Buffer areas are submerged areas vulnerable to rising seawater or high value upland habitats. Future development in the Operational Buffer is permitted for low impact or small footprint facilities that may be required for support of space launch or landing operations. The Primary site is undeveloped and consists of abandoned citrus groves, uplands, and wetlands overgrown in invasive exotic species; a complex of unpaved site access roads, and man-made ditches.

In-Kind sites 6, 10, 11 and 12 are also located in portions of KSC designated for Renewable Energy; none of these sites are developed. In-Kind sites 6, 10, and 11 are abandoned citrus groves covered in invasive exotic species. Site 10 does not appear to have ever been developed.

3.1.1.2 Visual/Aesthetic Resources

The Primary site is located directly across NASA Parkway West (SR 405) from the KSC Visitor Center Complex. Public view of the Primary site is limited to the view facing north from the Visitor Center and NASA Parkway West (SR 405). The current view from this direction consists of a dense stand of the exotic invasive shrub Brazilian pepper (*Schinus terebinthifolius*) and Australian pine (*Casuarina equisetifolia)*. The interior of the site is not accessible to or within the line of sight of the public, except from the south.

In-Kind sites 1 to 10 are within the secure KSC perimeter and are restricted from general public access. In-Kind sites 1, 2, 3, 4, 5, 7, 8, and 9 are paved parking lot facilities in developed areas of KSC. In-Kind site 6 is in a remote location south of Schwartz Road and In-Kind site 10 is an undeveloped area situated among developed and undeveloped land. In-Kind sites 11 and 12 are not within the KSC secure perimeter; they are located adjacent to an existing FPL 10-MW PV solar facility.

There are several notable visual structures on KSC, including lightning protection towers, Vehicle Assembly Building (VAB) and the Visitor Complex Space Shuttle Atlantis External Tank and Solid Rocket Booster Display. Light sources at KSC include nighttime security lighting at the launch complexes and buildings.

3.1.1.3 Coastal Zone

The entire state of Florida is within the Coastal Zone. Federal actions within the coastal zone must be developed in accordance with the Coastal Zone Management Act (CZMA) of 1972, which is implemented by NOAA through the FDEP. The CZMA provides for management of coastal uses and resources and encourages a balance between coastal resource protection and need for economic growth and development in the coastal zone. Federal actions that affect land or water uses or natural resources within the Coastal Zone in Florida must be reviewed for consistency with Florida's Coastal Management Program, which consists of 24 statutes protecting coastal resources. Federal activities at NASA-KSC that are likely to need a consistency determination include regulated activities in state or federal wetlands or surface waters, new point or non-point source discharge to surface waters, or major industrial or development expansion projects.

3.1.2 Environmental Consequences

3.1.2.1 Land Use

Implementation of the Proposed Action would have no effect on land use for sites designated for Renewable Energy. This includes the majority of the Primary site as well as In-Kind sites 6, 10, 11 and 12.

An amendment to the CMP would be required for the Proposed Action on the sites not currently designated for Renewable Energy. These include a small portion of the Primary site and In-Kind sites 1, 2, 3, 4, 5, 7, 8, and 9. The area of land use change that would be needed for the Proposed Action is very small compared to the total area for each of the affected land use designations (Table 3-2). NASA-KSC has determined the amendment change would be considered minor.

The In-Kind projects located on parking lots and mounted to canopies would not result in the loss of parking spaces. These include In-Kind sits 2, 3, 4, 7, and 9. These effects would be minor but beneficial over the long-term. Some parking spaces would be lost for the In-Kind projects proposed as ground-mounts. These include In-Kind sites 1, 5, and 8. These effects would be minor given the ample parking in surrounding parking lots.

No-Action Alternative

Under the No-Action Alternative, there would be no effect to land use designations or functional use as there would be no changes to land use designations.

3.1.2.2 Visual/Aesthetic Resources

Implementation of the Proposed Action at the Primary site and the undeveloped portions of the In-Kind sites would result in changes to the visual landscape, at those sites. Vegetation would be removed in order for the solar PV arrays to be mounted; however, the vast majority of the vegetation that would be removed is invasive exotic species (e.g. Brazilian pepper). The construction activity at the Primary site would result in a short-term minor impact to visual resources/aesthetics to visitors at the Visitor complex.

Once installed, the solar PV arrays or canopies would be visible from the adjacent roadways. However, these arrays would not be tall (approximately 7 feet) and would have a negligible effect on the surrounding view shed. At the Primary site, the PV arrays would be visible from the Visitor Center Complex and NASA Causeway West. This is expected to have an overall beneficial effect to the public as it provides an educational opportunity to see renewable energy generation in practice. Since all 12 In-Kind sites are located in areas restricted from general public use, aesthetic impacts during construction and long-term are expected to be negligible.

If night-time security lighting is installed for the Proposed Action, it will installed and operated according to KSC's guidelines for exterior lighting, outlined in Chapter 24 of Kennedy NASA Procedural Requirements (KNPR) 8500.1 Rev. E (NASA, 2018). This includes development and implementation of a Lighting Operations Manual. As such, effects from lighting are expected to be intermittent and minor.

No-Action Alternative

Under the No-Action Alternative, the land use designation for all proposed site locations would not change and there would be no effects to aesthetics

3.1.2.3 Coastal Zone

The Proposed Action on the Primary site and the undeveloped In-Kind sites 6, 10, 11 and 12 has the potential to affect coastal zone resources, including wetlands and surface water drainages (ditches). The Project development on these undeveloped sites will be reviewed for consistency with the Florida's Coastal Management Program's 24 statutes protecting coastal resources as part of the NEPA public review and FDEP's ERP review process. Potential adverse effects to these resources will be avoided and minimized to the extent practicable and unavoidable impacts will be permitted by the USACE and FDEP. Overall, the Proposed Action will probably have a minor long-term effect on coastal zone resources.

No effect to coastal zone resources is expected to result from the Proposed Action on the developed In-Kind sites 1, 2, 3, 4, 5, 7, 8, and 9 since there are no surface or water resources at these locations.

No Action Alternative

Under the No Action Alternative, there would be no new development and, therefore, no effect to coastal zone resources.

3.2 Noise

3.2.1 Affected Environment

According to NASA-KSC's ERD (2015a), the 24-hour average ambient noise level on NASA-KSC is lower than the EPA recommended upper level of 65 decibels (dBA), which is based on a scale ranging from approximately 10 dBA for the rustling of grass or leaves to 115 dBA, the unprotected hearing upper limit for exposure to a missile or space launch. There are five primary sources of noise at NASA-KSC from day-to-day operations. These include (1) launches, (2) aircraft movements, (3) industrial operations, (4) construction, and (5) traffic noise.

Ambient noise levels at the Primary site and In-Kind sites 6, 11 and 12 are low and are limited to occasional vehicular traffic. Ambient noise levels at the In-Kind sites in developed areas (In-Kind sites 1 to 5 and 7 to 10) are higher and include vehicular traffic and operational activities in the range of 55 to 78 dBa.

3.2.2 Environmental Consequences

While construction of the solar PV facility would temporarily increase noise levels at the Primary and 12 In-Kind sites, these levels would be minor, localized and short-term. Operation and maintenance of the solar PV facility would not create substantial sources of noise . Some noise would be created by facility inverter equipment. A study prepared for Massachusetts Clean Energy Center (MCEC, 2012) found that, "At the utility scale sites, sound levels along the fenced boundary of the PV arrays were generally at background levels, though a faint inverter hum could be heard at some locations along the boundary. Any sound from the PV array and equipment was inaudible and sound levels are at background levels at set back distances of 50 to 150 feet from the boundary." Noise impacts resulting from operation of the Proposed Action are likely to be negligible and long-term.

No Action Alternative

Under the No Action Alternative, there would be no new construction or operation of solar facilities and, therefore, no effect to noise.

3.3 Biological Resources

3.3.1 Affected Environment

3.3.1.1 Vegetation and Habitats

NASA-KSC is comprised of a wide variety of vegetation and habitat types, including tidal saltwater marshes and mangroves; freshwater wetland marshes, shrubs, and forests; xeric and mesic upland forests and hammocks; and disturbed habitats including ruderal herbaceous uplands, former citrus groves that have transitioned to Brazilian pepper and Australian pine stands.

The vegetation and habitat types occurring on the Primary site and 12-Kind sites, based on land cover mapping provided by NASA (2010), are depicted on Figure 3-1 and acreages for each land cover type on the Primary and undeveloped In-Kind sites is summarized in Table 3-3, by site. TRC scientists conducted several site visits between April and June 2018 to ground-truth and confirm (at a high level) the mapped land-cover types. Photographs taken during May 2018 site visits are provided in Appendix B for the Primary site and Appendix C for the un-developed In-Kind sites. A description of the land cover types for each site is provided below. There are no salt-water habitats or waters within the limits of the Primary site or 12 In-Kind sites.

Table 3-3. Land Cover Types on the Primary Site and 12 In-Kind Project Sites

Site	Land Cover Type	Code	Acres	Ha	% of Total
Primary Site	Brazilian pepper/abandoned citrus	19	372.40	150.71	53.1%
	Hardwood hammock	30	250.83	101.51	35.7%
	Australian pine	21	28.04	11.35	3.99%
	Wetland scrub-shrub(freshwater)	15	21.01	8.50	3.0%
	Wetland hardwood forest	17	7.54	3.05	1.1%
	Wetland coniferous/hardwood forest	16	7.50	3.04	1.1%
	Infrastructure (primary & secondary)	3 & 4	9.59	3.88	1.4%

Table 3-3. Land Cover Types on the Primary Site and 12 In-Kind Project Sites					
Site	**Land Cover Type**	**Code**	**Acres**	**Ha**	**% of Total**
	Cabbage palm	29	3.64	1.47	0.5%
	Ruderal (herbaceous)	18	1.07	0.43	0.2%
	Ruderal (woody)	20	0.10	0.04	0.0%
	Water (interior, fresh)	7	0.083	0.034	0.0%
		Total	701.81	284.01	100%
In-Kind Site 6	Brazilian pepper/abandoned citrus	19	40.74	16.48	82%
	Ruderal (woody)	20	8.59	3.48	17%
	Water (interior, fresh)	7	0.10	0.04	0.2%
	Ruderal (herbaceous)	18	0.00	0.00	0%
		Total	49.43	20.00	100%
In-Kind Site 10	Upland coniferous/hardwood forest	27	22.38	9.06	77%
	Ruderal (herbaceous)	18	3.56	1.44	12%
	Hardwood hammock	30	2.42	0.98	8%
	Water (interior, fresh)	7	0.43	0.18	1%
	Wetland Marsh (freshwater)	12	0.15	0.06	1%
		Total	28.94	11.71	100%
In-Kind Site 11	Brazilian pepper/abandoned citrus	19	16.45	6.66	94%
	Hardwood hammock	30	0.80	0.32	5%
	Ruderal (herbaceous)	18	0.24	0.10	1%
		Total	17.50	7.08	100%
In-Kind Site 12	Brazilian pepper/abandoned citrus	19	38.77	15.69	81%
	Hardwood hammock	30	6.21	2.51	13%
	Ruderal (herbaceous)	18	2.29	0.93	5%
	Infrastructure (secondary)	4	0.60	0.24	1%
		Total	47.88	19.37	100%

Primary Site

Eleven land cover types are mapped on the Primary site. Two of these communities, Brazilian pepper/abandoned citrus and hardwood hammock, make up the vast majority (~89 percent) of the site, while the other nine land cover types comprise less than 4 percent each. The dominant land cover type comprises approximately 372 acres (151 ha and 53 percent) of the site and is former citrus groves that have become overgrown by Brazilian pepper, since the groves were abandoned between 2004 and 2008. These areas are very densely vegetated with Brazilian pepper and are difficult to traverse. They have low biodiversity and offer little wildlife habitat support. Man-made agricultural ditches used to drain water from the groves during active production, traverse this habitat type. These ditches have not been maintained for at least 10 years. This community type is mapped as Brazilian pepper or citrus on Figure 3-1 and is identified as Brazilian pepper/abandoned citrus in Table 3-3. According to the ERD (NASA 2015a), this is an upland land cover type. Cogon grass (*Imperata cylindrica*), an exotic invasive grass species, is also prevalent in this community.

Hardwood hammock is the second prevalent land cover type on the Primary site, making up about 251 acres (102 ha and 36 percent) of the site. Based on the ERD (2015), this is a forested habitat found on shallow rises within wetland communities. TRC's field visits indicate the areas on the Primary site mapped as hardwood hammock are a mosaic of upland and wetland communities vegetated by live oak (*Quercus virginiana*), laurel oak (*Quercus laurifolia*), cabbage palm (*Sabal palmetto*), slash pine (*Pinus elliottii*), American elm (*Ulmus americana*), red maple (*Acer rubrum*), wax myrtle (*Myrica cerifera*), saw palmetto (*Serenoa repens*), wild coffee (*Psychotria nervosa*), Spanish needles (*Bidens alba*), and a mix of ferns, grasses, sedges, and rushes. Cypress (*Taxodium ascendens*) and willow (*Salix caroliniana*) are present in the wetter habitats. Invasive species are also problematic in this habitat type and include Brazilian pepper, Australian pine, cogon grass, Britton's wild petunia (*Ruellia simplex*), caesarweed (*Urena lobata*), and old world climbing ferns (*Lygogodium* spp.), among others. Scrubby flatwoods primarily comprised of slash pine are found at the transitional edges of the forested wetlands.

Monoculture stands of the invasive Australian pine are scattered around the Primary site, predominantly along man made ditches/canals. This cover type accounts for approximately 28 acres (11 ha and 4 percent) of the Primary site, and offers little habitat support to wildlife.

<u>In-Kind Sites</u>
In-Kind sites 1, 2, 3, 4, 5, 7, 8, and 9 are mapped as primary infrastructure, which include structures and paved surfaces (NASAa, 2015), with small percentages of ruderal herbaceous cover types present on each. TRC's site visit conducted in April 2018, confirmed these sites are paved parking lots. The ruderal herbaceous cover consists of maintained grass fields/roadsides adjacent to the parking lots. In-Kind site 7 is currently under construction; no natural communities remain on this site.

In-Kind site 6 is mostly (82 percent) comprised of abandoned citrus groves that have transitioned to dense stands of Brazilian pepper, intermixed with cabbage palm and Britton's petunia (41 acres [16.5 ha]). Similar to the Primary site, man-made agricultural ditches constructed to manage water flow when the groves were active are located throughout the site. An approximately 9-acre (3.5 ha) strip of ruderal woody forest is situated between the former groves, as shown on Figure 3-1.

In-Kind Site 10 is the least disturbed of the In-Kind sites. It is comprised of upland mixed coniferous/hardwood forest, oak scrub, ruderal herbaceous areas, hardwood hammock, a ditch, small freshwater marsh. The forested area accounts for most of the site (85 percent) and is comprised of a mix of Brazilian pepper, slash pine, live oaks, cabbage palm, Britton's wild petunia, and saw palmetto, which has been almost completely covered in grape vine (*Vitus rotundifolia*). The marsh is predominately vegetated with Carolina willow.

In-Kind Sites 11 and 12 are adjacent to one another and have similar vegetation cover. Both were formerly managed citrus groves that have been abandoned and have transitioned into a dense stand of Brazilian pepper intermixed with small live oaks and cabbage palm. The highest quality habitat of these two sites is an approximately 6-acre (2.5 ha) hardwood hammock on the southern end of In-Kind site 12. Agriculture and roadside ditches are present in and around the sites.

3.3.1.2 Wetlands and Surface Waters

For purposes of this EA, wetland designations are based on land-cover types (NASA, 2010). TRC scientists conducted a high-level field reconnaissance of the Primary and In-Kind sites between April and June

2018, to determine the accuracy of the land use maps. Generally, TRC scientists confirmed the land-cover mapping was accurate; however, the dense Brazilian pepper infestation across the undeveloped sites limited the accessibility and view to many areas. FPL will perform a thorough wetland delineation on each of the sites to confirm the state and federal regulatory boundaries and will obtain any required wetland permits prior to construction. Table 3-4 summarizes the estimated area of wetlands and surface waters on each site. These estimates do not include agricultural ditches interspersed among the abandoned citrus groves, which are densely covered in Brazilian pepper.

Table 3-4. Wetland and Other Surface Waters on the Primary Site and 12 In-Kind Project Sites

Site	Land Cover Type	Acres	Hectares	% of Total
Primary Site	Forested wetland	265.87	107.59	38%
	Scrub-Shrub wetland	21.01	8.50	3%
	Surface waters	0.083	0.034	0%
	Upland	414.84	167.88	59%
	Total	701.81	284.01	100%
In-Kind Site 1	Upland	2.23	0.90	100%
In-Kind Site 2	Upland	1.04	0.42	100%
In-Kind Site 3	Upland	3.37	1.36	100%
In-Kind Site 4	Upland	3.18	1.29	100%
In-Kind Site 5	Upland	0.40	0.16	100%
In-Kind Site 6	Surface waters	0.10	0.04	0.2%
	Upland	49.32	19.96	100%
	Total	49.43	20.00	100%
In-Kind Site 7	Upland	3.10	1.26	100%
In-Kind Site 8	Upland	4.47	1.81	100%
In-Kind Site 9	Upland	3.98	1.61	100%
In-Kind Site 10	Forested wetland	2.42	0.98	8%
	Freshwater marsh	0.15	0.06	1%
	Surface waters	0.43	0.18	1%
	Upland	25.94	10.50	90%
	Total	28.94	28.94	100%
In-Kind Site 11	Forested wetland	0.80	0.32	5%
	Upland	16.70	6.76	95%
	Total	17.50	7.08	100%
In-Kind Site 12	Forested wetland	6.21	2.51	13%
	Upland	41.66	16.86	87%
	Total	47.88	19.37	100%

Primary Site
Approximately 41 percent of the Primary site is estimated to be regulated wetlands, based on land-cover mapping and limited field reconnaissance by TRC in spring 2018. Given the lack of maintenance and poor condition of the agricultural ditches onsite, it is possible more area would be classified as state or federal jurisdictional wetland than is indicated by the mapping. A detailed wetland delineation has not been performed for the Primary site yet, but will be done prior to construction to obtain any needed state and federal wetland permits (e.g. USACE Section 404 and FDEP ERP).

In-Kind sites
There are no wetlands and no surface waters on the undeveloped In-Kind sites 1 to 5 and 7 to 9. In-Kind site 6 also lack wetlands, but has man-made ditches that traverse the site. Approximately 9 percent of In-Kind site 10 is wetland, consisting of both forested and marsh communities. Ninety percent of In-Kind site 10 is upland. In-Kind sites 11 and 12 both contain forested wetlands (5 percent and 13 percent of each site, respectively).

3.3.1.3 Wildlife

Habitat on the Primary site has potential to support a variety of fish, reptile, amphibian, mammal, and bird species. The ditches and connected wetlands could support several species of small fish such as mosquitofish (*Gambusia affinis)*, sailfin mollies (*Poecilia latipinna*), flag fish *Jordanella floridae*), warmouth (*Lepomis gulosus)*, golden shiner (*Notemigonus crysoleucas)*, golden topminnow (*Fundulus chrysotus*), and bluefin killifish (*Lucania goodie*). Similar small fish species could occur in ditches on In-Kind site 6, but are unlikely to occur on the other In-Kind sites due to lack of suitable habitat.

Seventy-one species of amphibians and reptiles have been documented as occurring on NASA-KSC (Seigel et al. 2002). These include four aquatic/semi-aquatic salamanders, 16 frogs and toads, one alligator, 11 turtles, 12 lizards, and 27 snakes. There is limited suitable habitat for a number of these species on the Primary site and the undeveloped In-Kind sites 6, 10, 11, and 12. The alligator (*Alligator mississippiensis*) is likely to inhabit the ditches and wetlands. The green anole (*Anolis carolinensis*), brown anole (Anolis *sagrei*), oak toad (*Anaxyrus quercicus*), southern toad (*Anaxyrus terrestris*), tree frogs (*Hyla* sp.), southern leopard frog (*Lithobates sphenocephalus*), and black racer (*Coluber constrictor)* are also likely to occur on the Primary site and may occur in limited areas on In-Kind sites 6, 10, 11, and 12 that are not densely overgrown in Brazilian pepper.

There are 29 species of mammals documented to occur on NASA-KSC (NASA, 2015a). Species likely to occur on the Primary site or undeveloped portions of the In-Kind sites include raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), nine-banded armadillo (*Dasypus novemcinctus*), eastern cottontail (*Sylvilagus floridanus*), white-tailed deer (*Odocoileus virginianus*), bobcat (*Felis rufus)*, and wild hog (*Sus scrofa).* Numerous wild hog sightings were made by TRC on the Primary site during the April and May 2018 site visits. There is a large population of wild hogs on NASA-KSC, which cause a variety of environmental problems, including destruction of native habitats.

There are 318 species of birds documented on NASA-KSC and 87 nesting species. Of these, over 100 species are winter residents and over 100 species are classified as migratory or accidental (NASA, 2015a). Forested habitats on the Primary site that are not overgrown with Brazilian pepper, have potential to support hawks, owls, and songbirds. Wading birds may forage in in roadside ditches or wetlands that are not densely vegetated. The mourning dove (*Zenaida macroura*) and American robin (*Turdus migratorius*) are also likely to occur on the Primary and undeveloped In-Kind sites.

3.3.1.4 Protected Species

Threatened and Endangered Plant Species

There are 36 state or federally protected plant species known to occur on or in the vicinity of NASA-KSC (NASA, 2015a). These are identified in Table 3-5, along with their likelihood to occur on the Primary site or one of the undeveloped In-Kind sites, based on their habitat requirements. No federally listed species are expected to occur on any of the sites due to lack of suitable habitat, poor quality habitat, or limited availability of habitat.

Primary Site

One state protected species, cinnamon fern (*Osmunda cinnamomea*), has a high chance of occurring on the Primary site and 12 state protected plant species have medium potential to occur on the Primary site. Five of these are commercially exploited, one is threatened and, seven are endangered.

The commercially exploited species, which occur frequently in the wild but are protected due frequent collection, include cinnamon fern (*Osmunda* cinnamomea), royal fern (*Osmunda regalis* var. *spectablilis*), coontie (*Zamia pumila*), butterfly orchid (*Encyclia tampensis*) and greenfly orchid (*Epidendrum canopseum*). The ferns and orchids grow in a variety of swamps and forested wetlands while coontie inhabits drier areas such as oak hammocks and pinelands. Cinnamon fern is a common wetland species and has the greatest potential to occur on the Primary site.

False coco (*Pteroglossaspis ecristata*), is a state threatened orchid that grows in scrub and dry flatwood habitats. It has a medium potential to occur in the drier forested areas of the Primary site. Only one population of this species is known to occur on NASA-KSC (NASA, 2015a).

The seven endangered species include two bromeliads, two ferns, and three perennial herbs. The two endangered bromeliads are common wild pine (*Tillandsia fasciculata*) and giant wild pine (*Tillandsia utriculata*). Both epiphytic species grow on trees in hammocks, cypress swamps, or pinelands. A few populations of each are known to occur on NASA-KSC (NASA, 2015a).

Hand fern (*Ophioglossum palmatum)* is an epiphytic fern that grows in the bases of palm fronds or boots (old leaf bases) of cabbage palms in coastal and wet hammocks. There are three extant and one historic population known to occur on NASA-KSC (NASA, 2015a). Plume polypody (*Pecluma plumula*) is an epiphytic fern that grows in tree branches or limestone in hammocks and wet woods.

Tampa vervain (*Glandularia tampensis*) is a perennial herb that occurs in moist cabbage palm-live oak hammocks and pine - palmetto flatwoods. There are a few small populations of this species known to occur on NASA-KSC.

Fall-flowering ixia (*Nemastylis floridana*) is a perennial herb that grows in marshes, wet prairies, wet flatwoods, and edges of cabbage palm hammocks. Only one population of this species is known to occur on NASA-KSC (NASA, 2015a).

Peperomia (*Peperomia humilis*) is a small perennial herb that grows in maritime hammocks, upland hardwood forests and swamps.

In-Kind Sites
There is a medium potential for cinnamon fern to occur in wetlands on In-Kind sites 10, 11 and 12 and medium potential for false coco to occur in dry habitats on In-Kind site 10. No protected plant species are expected to occur on In-Kind sites 1 to 5 or 7 to 9 due to lack of suita0111111111111111111111ble habitat.

<u>Threatened and Endangered Wildlife Species</u>
There are 29 known federally and state listed wildlife species documented as occurring on NASA-KSC. These are listed in Table 3-6, along with their preferred habitat and potential to occur on the Primary site or one of the undeveloped In-Kind sites.

Primary Site
Ten of the listed wildlife species have at least a medium chance to occur on the Primary site. These include the alligator (*Alligator mississippiensis*), gopher frog (*Lithobates capito*), gopher tortoise (*Gopherus polyphemus*), eastern indigo snake (*Drymarchon couperi*), and six wading bird species: little blue heron (*Egretta caerulea*), reddish egret (*Egretta rufescens*), snowy egret (*Egretta thula*), tricolored heron (*Egretta tricolor*), wood stork (*Mycteria americana*), White ibis (*Eudocimus albus*), and limpkin (*Aramus guarauna*).

The alligator is a federally threatened species because of its similar appearance to the federally endangered crocodile, not because its population is declining. The alligator is likely to occur abundantly in the wetland and ditches on the Primary site.

The six listed wading bird species have potential to forage or nest wetlands on the Primary site. Studies conducted at NASA-KSC indicate wading birds prefer feeding in the impounded salt marsh habitat and shallow areas along the estuarine shorelines, but will feed in marsh grasses, particularly when the water level is high. Roadside ditches and natural freshwater swales are not used by as many wading birds as are the impoundments but they are also an important component of the overall feeding habitat for wading birds on NASA-KSC. There are no known rookeries on or near the Primary site.

Common Name Scientific Name	Protection Status: Federal	Protection Status: State	Preferred Habitat	Likelihood of Occurrence: Primary Site	In-Kind Site 6	In-Kind Site 10	In-Kind Site 11	In-Kind Site 12
Curtiss milkweed *Asclepias curtissii*		E	Oak scrub, dry hammocks, flatwoods	Low	Low	Low	None	None
Sea rosemary *Argusia gnaphalodes*		E	Coastal dunes	None	None	None	None	None
Curtiss reedgrass *Calamovilfa curtissii*		T	Wet flatwoods, shallow swales in pines	Low	None	Low	Low	Low
Many-flowered grass pink *Calopogon multiflorus*		T	Pine flatwoods	Low	Low	Low	Low	Low
Sand dune spurge *Chamaesyce cumulicola*		E	Coastal dunes, strand and scrub	None	None	None	None	None
Satinleaf *Chrysophyllum oliviforme*		T	Hammocks, pinelands	Low	Low	Low	Low	Low
Butterfly orchid *Encyclia tampensis*		C	Hammocks, hardwood swamps - epiphytic	**Medium**	None	Low	Low	Low
Greenfly orchid *Epidendrum canopseum*		C	Hammocks, hardwood swamps - epiphytic	**Medium**	None	Low	Low	Low
Coastal vervain *Glandularia maritima*		E	Coastal dunes and strand -openings	None	None	None	None	None
Tampa vervain *Glandularia tampensis*		E	Edge of hammocks, flatwoods	**Medium**	Low	Low	Low	Low
Angle-pod *Gonolobus suberosus*		T	Hammocks, bluffs, floodplains	None	None	None	None	None
Threadroot orchid *Harrisella filiformis*		T	Hardwood swamps - epiphytic	Low	None	Low	Low	Low
Indian River prickly-apple *Harrisia fragrans*	E	E	Coastal hammocks and shell beds	None	None	None	None	None

Table 3-5 Protected Plant Species Known to Occur on or in the Vicinity of NASA-KSC

Table 3-5 Protected Plant Species Known to Occur on or in the Vicinity of NASA-KSC								
Common Name Scientific Name	**Protection Status**		**Preferred Habitat**	**Likelihood of Occurrence**				
	Federal	**State**		**Primary Site**	**In-Kind Site 6**	**In-Kind Site 10**	**In-Kind Site 11**	**In-Kind Site 12**
Crested coralroot *Hexalectris spicata*		E	Pine-hickory woods, calcareous hammocks	Low	Low	Low	Low	Low
East coast lantana *Lantana depressa*		E	Coastal strand and scrub, coquina scrub	None	None	None	None	None
Nodding pinweed *Lechea cernua*		T	Scrub openings	Low	Low	Low	None	None
Pine pinweed *Lechea divaricata*		E	Scrub openings	Low	Low	Low	None	None
Catesby lily *Lilium catesbaei*		T	Pine flatwoods	Low	None	Low	Low	Low
Nakedwood *Myrcianthes fragrans*		T	Hammocks, coastal strand	Low	Low	Low	Low	Low
Fall-flowering ixia *Nemastylis floridana*		E	Hammocks, wet flatwoods	**Medium**	Low	Low	Low	Low
Hand fern *Ophioglossum palmatum*		E	Hammocks - epiphytic on cabbage palm	**Medium**	Low	Low	Low	Low
Shell mound prickly-pear *Opuntia stricta*		T	Coastal dunes and strand	None	None	None	None	None
Cinnamon fern *Osmunda cinnamomea*		C	Hardwood swamps	**High**	Low	**Medium**	**Medium**	**Medium**
Royal fern *Osmunda regalis* var. *spectablilis*		C	Hardwood swamps	**Medium**	Low	Low	Low	Low
Plume polypody *Pecluma plumula*		E	Hammocks - epiphytic	**Medium**	Low	Low	Low	Low
Peperomia *Peperomia humilis*		E	Hammocks	**Medium**	Low	Low	Low	Low
Florida peperomia		E	Rockland hammocks - epiphytic	None	None	None	None	None

Table 3-5 Protected Plant Species Known to Occur on or in the Vicinity of NASA-KSC

Common Name Scientific Name	Protection Status		Preferred Habitat	Likelihood of Occurrence				
	Federal	State		Primary Site	In-Kind Site 6	In-Kind Site 10	In-Kind Site 11	In-Kind Site 12
Peperomia obtusifolia								
Rose pogonia *Pogonia ophioglossoides*		T	Marshes and wet pine flatwoods	Low	None	Low	Low	Low
False coco *Pteroglossaspis ecristata*		T	Scrub and dry flatwoods	**Medium**	Low	**Medium**	Low	Low
Beach-star *Remirea maritima*		E	Coastal dunes	None	None	None	None	None
Scaevola *Scaevola plumieri*		T	Coastal dunes and strand	None	None	None	None	None
Lace-lip ladies'-tresses *Spiranthes laciniata*		T	Marshes	Low	None	Low	Low	Low
Narrow-leaved hoary peal *Tephrosia angustissima var. curtissii*		E	Coastal dunes and strand	None	None	None	None	None
Common wild pine *Tillandsia fasciculata*		E	Hammocks, cypress swamps, pinelands and hardwood - epiphytic	**Medium**	Low	Low	Low	Low
Giant wild pine *Tillandsia utriculata*		E	Hammocks and hardwood swamps - epiphytic	**Medium**	Low	Low	Low	Low
East coast coontie *Zamia pumila*		C	Oak hammocks, pinelands	**Medium**	Low	Low	Low	Low

Notes:
E = Endangered, T = Threatened, C = Commercially Exploited
Likelihood of occurrence:
None = No chance of presence due to lack of suitable habitat for the species
Low = Some potentially suitable, low quality habitat present
Med = potentially suitable habitat present
High = substantial amount of suitable habitat present where species is known to occur

Table 3-6 Protected Wildlife Species Known to Occur on NASA-KSC								
Common Name Scientific Name	Protection Status		Preferred Habitat	Likelihood of Occurrence				
				Primary Site	In-Kind Sites			
	State	Federal			6	10	11	12
Amphibians and Reptiles								
Florida gopher frog *Lithobates capito*	SSC		Dry, sandy uplands, mainly sandhill and scrub that include isolated wetlands or large ponds within about 1 mi. (1.7 km); occasional in dry pine flatwoods, xeric hammock, and disturbed examples of above; breeds mainly in seasonally flooded, temporary ponds, but also in some permanent waters	**Med**	Low	**Med**	Low	Low
American alligator *Alligator mississippiensis*		T(S/A)	Most permanent bodies of fresh water, including marshes, swamps, lakes, and rivers; occasionally wanders into brackish and salt water but rarely remains there	**High**	**Med**	**Med**	**Med**	**Med**
Loggerhead *Caretta caretta*		T	Marine coastal and oceanic waters; nest on coastal sand beaches	None	None	None	None	None
Atlantic green turtle *Chelonia mydas*		E	Estuarine and marine coastal and oceanic waters; nests on coastal sand beaches	None	None	None	None	None
Leatherback sea turtle *Dermochelys coriacea*		E	Oceanic waters; nests on coastal sand beaches;	None	None	None	None	None
Gopher tortoise *Gopherus polyphemus*	T	C	Sandhills, dry hammocks, longleaf pine-turkey oak woods, old fields	**Med**	**Med**	**Med**	Low	Low
Eastern indigo snake *Drymarchon couperi*		T	Broad range of habitats, from scrub and sandhill to wet prairies and mangrove swamps; may winter in gopher tortoise burrows in sandy uplands but forages in more hydric habitats; requires very large tracts to survive.	**Med**	**Med**	**Med**	**Med**	**Med**
Florida pine snake *Pituophis melanoleucus mugitus*	SSC		Habitats with relatively open canopies and dry sandy soils, in which it burrows, especially sandhill and former sandhill, including old fields and pastures, but also sand pine scrub and scrubby flatwoods	Low	Low	Low	Low	Low

Table 3-6 Protected Wildlife Species Known to Occur on NASA-KSC

Common Name Scientific Name	Protection Status		Preferred Habitat	Likelihood of Occurrence				
				Primary Site	In-Kind Sites			
	State	Federal			6	10	11	12
Birds								
Brown pelican *Pelecanus occidentalis*	SSC		Mainly coastal, feeding in shallow estuarine waters, and (less often) far offshore	None	None	None	None	None
Little blue heron *Egretta caerulea*	SSC		Feeds in shallow freshwater, brackish, and saltwater habitats; largest nesting colonies occur in coastal areas, but prefers foraging in freshwater lakes, marshes, swamps, and streams; mests in a variety of woody vegetation types, including cypress, willow, maple, black mangrove, and cabbage palm; usually breeds in mixed-species colonies in flooded vegetation or on islands.	**Med**	Low	**Med**	Low	Low
Reddish egret *Egretta rufescens*	SSC		Almost exclusively coastal; typically nests on coastal mangrove islands, or in Brazilian pepper on manmade dredge spoil islands, near suitable foraging habitat; generally forages in shallow water(typically < 6 in. [15 cm]) of variable salinity; broad, open, marine tidal flats and shorelines with little vegetation are ideal feeding areas; also important are salt evaporation pools and lagoons, often located inside mangrove keys or just inside shoreline on mainland	Low	Low	Low	Low	Low
Snowy egret *Egretta thula*	SSC		Nests both inland and in coastal wetlands with nests placed in many types of woody shrubs, especially mangroves and willows; almost all nesting is over shallow waters or on islands that are separated from shoreline by extensive open water; feeds in many types of permanently and seasonally flooded wetlands, streams, lakes, and swamps, and in manmade impoundments and ditches; usually prefers calm waters; a wide variety of wetland types must be available within 5 - 7 mi. (8 - 11 km) to support breeding colonies;	**Med**	Low	**Med**	Low	Low

Table 3-6 Protected Wildlife Species Known to Occur on NASA-KSC								
Common Name Scientific Name	Protection Status		Preferred Habitat	Likelihood of Occurrence				
	State	Federal		Primary Site	In-Kind Sites 6	10	11	12
Tricolored heron *Egretta tricolor*	SSC		Most nesting colonies occur on mangrove islands or in willow thickets in fresh water, but nesting sites include other woody thickets on islands or over standing water; prefers coastal environments; feeds in a variety of permanently and seasonally flooded wetlands, mangrove swamps, tidal creeks, ditches, and edges of ponds and lakes	**Med**	Low	**Med**	Low	Low
Wood stork *Mycteria americana*		E	Nests colonially in a variety of inundated forested wetlands, including cypress strands and domes, mixed hardwood swamps, sloughs and mangroves; increasingly nesting in artificial habitats (e.g., impoundments and dredged areas with native or exotic vegetation); forages mainly in shallow water in freshwater marshes, swamps, lagoons, ponds, tidal creeks, flooded pastures and ditches, where they are attracted to falling water levels that concentrate food sources (mainly fish)	**Med**	Low	**Med**	Low	Low
White ibis *Eudocimus albus*	SSC		Found in a wide variety of habitats, including freshwater and brackish marshes, salt flats and salt marsh meadows, many types of forested wetlands, wet prairies, swales, seasonally inundated fields, and man-made ditches; adults prefer foraging in freshwater areas when feeding young; nests are placed on a variety trees, shrubs, and vines, and tend to be closer to ground than other colonially nesting wading birds	**Med**	Low	**Med**	Low	Low
Roseate spoonbill *Ajaia ajaja*	SSC		Primarily nests in mixed-species colonies on coastal mangrove islands or in Brazilian pepper on man-made dredge spoil islands near suitable foraging habitat; occasionally nests in willow heads at freshwater sites; forages in shallow water of variable salinity, including tidal	Low	Low	Low	Low	Low

Common Name Scientific Name	Protection Status		Preferred Habitat	Likelihood of Occurrence				
				Primary Site	In-Kind Sites			
	State	Federal			6	10	11	12
			flats and ponds, coastal marshes, mangroves and pools, and freshwater sloughs and marshes.					
Southeastern American kestrel *Falco sparverius paulus*	T		(Year-round) found in open pine habitats, woodland edges, prairies, and pastures; availability of suitable nesting sites is key during breeding season; nest sites are tall dead trees or utility poles generally with an unobstructed view of surroundings; sandhill habitats seem to be preferred, but may also occur in flatwoods; open patches of grass or bare ground are needed in flatwoods settings, since thick palmettos prevent detection of prey	Low	Low	Low	Low	Low
Limpkin *Aramus guarauna*	SSC		Mangroves, freshwater marshes, swamps, springs and spring runs, and pond and river margins; also lake margins, swales, strand swamps, sloughs, and impoundments; may also forage in ruderal areas such as fields and banks of irrigation canals; wide range of nesting sites, including mounds of vegetation and marsh grasses, among cypress knees, and high in trees.	**Med**	Low	**Med**	Low	Low
Florida sandhill crane *Grus canadensis pratensis*	T		Prairies, freshwater marshes, and pasture lands; avoids forests and deep marshes but uses transition zones and edges between these and prairies or pasture lands; will frequent agricultural areas like feed lots and crop fields, and also golf courses and other open lawns, especially in winter and early spring; nest is a mound of herbaceous plant material in shallow water or on the ground in marshy areas; favors wetlands dominated by pickerelweed and maidencane	Low	Low	Low	Low	Low
Piping plover *Charadrius melodus*		T	Open, sandy beaches and on tidal mudflats and sandflats along the coast	None	None	None	None	None

Table 3-6 Protected Wildlife Species Known to Occur on NASA-KSC								
Common Name Scientific Name	Protection Status		Preferred Habitat	Likelihood of Occurrence				
				Primary Site	In-Kind Sites			
	State	Federal			6	10	11	12
American oystercatcher *Haematopus palliatus*	SSC		Require large areas of beach, sandbar, mud flat, and shellfish beds for foraging; they use sparsely vegetated, sandy areas for nesting	None	None	None	None	None
Rufa red knot *Calidris canutus rufa*		T	Coastal marine and estuarine habitats with large areas of exposed intertidal sediment	None	None	None	None	None
Least tern *Sterna antillarum*	T		Coastal areas including beaches, lagoons, bays, and estuaries; nesting areas have a substrate of well-drained sand or gravel and usually have little vegetation	None	None	None	None	None
Roseate tern *Sterna dougallii*		T	Nest sites include bare limestone, shell-sand beaches, newly deposited rock and marl fill, dredge material, and heaps of broken coral deposited by storms; also nests on rooftops. Forages for small, schooling fish in open water over sandbars, reefs, and tidal channels	None	None	None	None	None
Black skimmer *Rynchops niger*	SSC		Coastal waters, including beaches, bays, estuaries, sandbars, tidal creeks (foraging), and also inland waters of large lakes, phosphate pits, and flooded agricultural fields; nests primarily on sandy beaches, small coastal islands, and dredge spoil islands	None	None	None	None	None
Florida scrub-jay *Aphelocoma coerulescens*		T	Inhabits fire dominated, low-growing, oak scrub habitat found on well-drained sandy soils; may persist in areas with sparser oaks or scrub areas that are overgrown, but at much lower densities and with reduced survivorship	Low	Low	Low	Low	Low
Mammals								
Southeastern beach mouse *Peromyscus polionotus niveiventris*		T	Primary, secondary, and occasionally tertiary sand dunes with a moderate cover of grasses and forbs; adjacent coastal palmetto flats (coastal strand) and scrub are important during and following hurricanes	None	None	Low	None	None

Table 3-6 Protected Wildlife Species Known to Occur on NASA-KSC								
Common Name Scientific Name	Protection Status		Preferred Habitat	Likelihood of Occurrence				
				Primary Site	In-Kind Sites			
	State	Federal			6	10	11	12
Florida mouse *Podomys floridanus*	SSC		Xeric upland communities with sandy soils, including scrub, sandhill, and ruderal sites where they inhabit burrows of the gopher tortoise; in the absence of gopher tortoises, will dig their own burrows or use those of old field mice	Low	**Med**	**Med**	None	None
West Indian manatee *Trichechus manatus*		E	Coastal waters, bays, rivers, and (occasionally) lakes; requires warm-water refugia such as springs or cooling effluent during cold weather; Sheltered coves are important for feeding, resting, and calving	None	None	None	None	None

Notes:
SSC = Species of Special Concern;
T(S/A) = threatened because of similarity of appearance to another protected species;
T = threatened;
E = endangered.
Likelihood of occurrence:
None = No chance of presence due to lack of suitable habitat for the species
Low = Some potentially suitable, low quality habitat present
Med = potentially suitable habitat present

The gopher tortoise is a state-threatened species and a candidate for federal listing. It is long-lived and considered a keystone species because its burrow provides important habitat for hundreds of invertebrate and vertebrate species, including several protected species. Gopher tortoises surveys conducted on NASA-KSC found tortoise burrows occur in the typical high, dry habitats, but tortoises may also utilize wetter habitats, such as the freshwater swales, for feeding. The vast majority of soils on the Primary site are poorly to very poorly drained and have a shallow water table, which is not ideal for gopher tortoise burrows. There is some potential for burrows in the higher drier portions of the site.

The gopher frog occupies a similar habitat as the gopher tortoise and often utilizes the tortoise burrow for refuge. During the breeding season, gopher frogs migrate to seasonally flooded freshwater swales that are found adjacent to the uplands habitats. Gopher frogs have only been documented at three sites on NASA-KSC and are not thought to be very common (NASA, 2015a). There is some potential the frog may occur in the uplands on the Primary site and use nearby wetlands for breeding.

The eastern indigo snake is a federally threatened species that occupies a wide varieties of habitats and requires large tracts of land for survival. The average home range size for radio tagged male indigos in Brevard County was 499 acres (202 ha) and the average home range size for females was 188 acres (76 ha) (Breininger et al. 2011). This snake has the potential to use a variety of habitats on the Primary site.

The Florida scrub-jay is a federally threatened species that is restricted to shrub lands with many scrub oaks and few trees (Burgman, et. al, 2001) and have their greatest demographic success when territories include a matrix of recently burned scrub and patches of scrub oaks with many open sandy areas (Breininger, et. al, 1998, 1999, 2001). Scrub-jays live in stable territories in family groups consisting of a long-term pair of breeders and their off-spring. On NASA-KSC, the average territory size of a breeding pair is 25 acres (10 ha).

The USFWS and MINWR have a goal to double the scrub-jay population on NASA-KSC, by improving habitat quality through land management efforts. As part of the management strategy, three habitat zones have been defined to categorize the importance and roles of different landscapes: core, support, auxiliary. Core areas are primary habitat (oak scrub on well-drained soils) and adjacent secondary habitat (large oak scrub ridges on poorly drained soils) that provide for large, contiguous clusters of territories. Contiguity of habitat is essential so that fire can spread across a landscape (NASA, 2015a). Most core habitat represents habitat of greatest importance to the Florida scrub-jay population and is essential for achieving recovery.

Support habitat is less important but is necessary for connecting population cores and providing a population with high persistence probabilities. Auxiliary habitat is of lower habitat quality. Table 3-7 identifies the area of each scrub-jay habitat zone on the Primary and In-Kind sites, based on the NASA-KSC Florida Scrub-Jay Compensation Plan (NASA, 2014). Approximately 172 acres (70 ha) of auxiliary zone occurs on the Primary site. However, no scrub jays or suitable habitat was observed on the Primary site during the baseline site evaluation performed by NASA-KSC in 2017 (NASA, 2017) or by TRC during field reconnaissance site visits in spring 2018.

Table 3-7. Area of Florida Scrub-Jay Habitat Zones on the Primary and In-Kind Sites							
	Core Zone		Support Zone		Auxiliary Zone		Total Site %
Site	Area	% of Site	Area	% of Site	Area	% of Site	
Primary	0	0%	0	0%	172 ac (70 ha)	25%	25%
In-Kind 6	0	0%	0	0%	39 ac (16 ha)	79%	79%
In-Kind 10	0	0%	18 ac (7 ha)	63%	11 ac (4 ha)	37%	100%
In-Kind 11	6 ac (2ha)	32%	0	0%	0.4 ac (0.2 ha)	2%	34%
In-Kind 12	0	0%	0	0%	16 ac (6 ha)	33%	33%

Source: NASA, 2014.

In-Kind Sites
The four undeveloped In-Kind sites (6, 10, 11, and 12) have limited habitat that could potentially support the American alligator and eastern indigo snake. The protected wading birds may utilize the wetlands on In-Kind site 10 for foraging. In-Kind sites 6 and 10 also have potentially suitable habitat for the gopher frog, gopher tortoise, and Florida mouse.

The Florida mouse occurs in xeric upland communities with sandy soils, including scrub, sandhill, and ruderal sites where they inhabit burrows of the gopher tortoise; in the absence of gopher tortoises, will dig their own burrows or use those of old field mice.

All four undeveloped In-Kind sites have scrub-jay habitat protection zones (NASA, 2014). About 79 percent of In-Kind site 6 is designated as auxiliary habitat. The entire In-Kind site 10 has scrub-jay management habitat; 63 percent is support habitat and 37 percent is auxiliary habitat. In-Kind site 11 has about 6 acres (2 ha) of core scrub-jay habitat. Approximately 33 percent of In-Kind site 12 is occupied by auxiliary habitat. No scrub-jays or suitable scrub-jay habitat was observed on the In-Kind sites during TRC's spring 2018 site reconnaissance visits.

No suitable habitat for listed wildlife species is present on the developed In-Kind sites 1 to 5 and 7 to 9.

Bald Eagles
The bald eagle (*Haliaeetus leucocephalus*) is a large raptor that is protected under the Bald and Golden Eagle Protection Act. Their habitat most commonly includes areas close to coastal areas, bays, rivers, lakes, or other bodies of water that provide concentrations of food sources, including fish, waterfowl, and wading birds. They usually nest in tall trees (mostly live pines) that provide clear views of surrounding area. Bald eagles arrive each year on NASA-KSC in the fall, nest during the winter, and leave NASA-KSC in early spring after the young have fledged. Records of bald eagle nesting have been kept on NASA-KSC continuously since 1978 by MINWR and/or FFWCC. The numbers of nests have increased steadily over the years. Between 1998 and 2014, the average number of nests was 11, and the average number of known fledglings per year was 15. Figure 3-3 shows the location of the active bald eagle nests relative to the Primary and In-Kind sites during the 2017 to 2018 nesting season. None of the nests, or their 660 ft (220 m) protection buffer, are located on the Primary or In-Kind sites.

Migratory Birds

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

3.3.2 Environmental Consequences

3.3.2.1 Vegetation and Habitats

The proposed changes to vegetation and habitats on the Primary site from the Proposed Action are summarized in Table 3-8.

Table 3-8. Proposed Impacts to Land cover Types on the Primary Site

Land Cover Type	Code	Existing Acres	Impact Acres	% of Total Impact	Remaining Acres	% Loss
Brazilian pepper/abandoned citrus	19	372.40	325.29	90%	47.11	87%
Hardwood hammock	30	250.83	11.92	3%	238.91	5%
Australian pine	21	28.04	7.57	2%	20.46	27%
Wetland coniferous/hardwood forest	16	7.50	5.90	2%	1.60	79%
Infrastructure (primary & secondary)	3 & 4	9.59	5.46	2%	4.13	57%
Cabbage palm	29	3.64	3.50	1%	0.14	96%
Ruderal (herbaceous)	18	1.07	0.20	0%	0.87	19%
Ruderal (woody)	20	0.10	0.06	0%	0.04	65%
Wetland hardwood forest	17	7.54	0.02	0%	7.52	0%
Water (interior, fresh)	7	0.08	0.00	0%	0.08	2%
Wetland scrub-shrub(freshwater)	15	21.01	0.00	0%	21.01	0%
Total		**701.81**	**359.93**	**100%**	**341.88**	

Approximately 360 acres of the Primary site would be developed for the Proposed action. The limits of disturbance would be focused towards the lower quality habitats and sensitive habitats such as wetlands would be avoided to the extent possible. Based on a preliminary layout, approximately 94 percent of the impact would occur in disturbed habitats, including former citrus groves that have transitioned to dense thickets of Brazilian pepper, Australian pine, ruderal habitats, and areas of infrastructure. Given the poor quality of these habitats, the effect would be minor, but long-term.

Site-specific layouts have not been developed for the In-Kind sites to date. For purposes of this EA, it is assumed that most each site would be used. The layout would be designed to avoid sensitive resources to the extent possible. These impacts are expected to be minor and long-term.

No-Action Alternative

Under the No-Action Alternative, no construction would occur and there would be no effect to vegetation or habitats.

3.3.2.2 Wetlands

Estimated wetland impacts on the Primary site from the Proposed Action are summarized in Table 3-9.

Table 3-9. Proposed Wetland Impacts on the Primary Site

Type	Existing Acres	Impact Acres	% of Total Impact	Remaining Acres	% Loss
Upland	414.84	342.09	95%	72.75	82%
Forested wetland	265.87	17.84	5%	248.04	7%
Surface waters	0.08	0.002	0%	0.08	2%
Scrub-shrub wetland	21.01	0.00	0%	21.01	0%
Total	**701.81**	**359.93**	**100%**	**341.88**	

FPL will avoid and minimize impacts to wetlands to the greatest extent possible with a strategic layout of the solar facilities focused on low quality habitats. Based on the preliminary layout, 95 percent of the proposed solar facilities would be in uplands and approximately 18 acres of wetlands may be affected. This would account for a 7 percent reduction in wetland area on the Primary site. These numbers are preliminary. A thorough wetland delineation will be conducted on the site prior to developing the final site layout. The final design will further avoid and minimize wetland impacts to the extent possible, with a focus on avoiding isolation of high quality wetlands for adjacent high quality upland habitats. An ERP from the FDEP and a Section 404 permit from the USACE would be obtained to authorize regulated activities in wetlands. Functional losses associated with unavoidable impacts will be compensated for by purchasing wetland mitigation credits from an approved mitigation bank, or by another approved method. Implementation of mitigation measures would ensure long-term impacts remain minor.

Wetland impacts on the In-Kind sites would also be avoided, minimized, and mitigated for.

No-Action Alternative

Under the No-Action Alternative, the Proposed Action would not be implemented and there would be no effects to wetlands.

3.3.2.3 Wildlife

Implementation of the Proposed Action on the Primary site and the vegetated In-Kind sites (6 and 10 to 12) would have both temporary and long-term minor impacts on non-listed wildlife species. During construction, some wildlife species may be temporarily disturbed by the presence of construction vehicles, equipment, and workers. Potential temporary impacts include elevated levels of noise from vehicles, machinery, and tools, or minor elevated air emissions from vehicles or equipment. Those species that are mobile can easily disperse from the area to adjacent locations if they are bothered or frightened, as there is substantial suitable (and higher quality) habitat in adjacent or nearby areas. The effect to less mobile species that are not able to readily relocate during construction activities is expected to be minor relative to the overall non-listed wildlife population on NASA-KSC.

Long term Impacts to wildlife species from operation of the solar PV facility would be minor and would stem from the removal of trees where the solar panels would be located and construction of a chain-link fence around the facility. The vast majority of vegetation removal would be Brazilian pepper; while these trees can provide some level of habitat to wildlife, NASA-KSC hosts far more pristine areas that include thousands of acres of both wetland and upland habitats. The chain-link fence could affect certain species from traversing the area. Species such as birds and snakes would not be affected by a fence. Similarly, species with climbing capabilities, such as raccoons, would also be unaffected. Larger species, including feral pigs and tortoises/turtles, could be negatively affected by a chain-link fence since it is more difficult to access the site. However, animals such as feral pigs and tortoises have been observed within the fence line of other FPL solar facilities and are capable of traversing the fence where certain conditions allow. Overall, this impact is expected to be minor and long-term.

There would be no impact to wildlife species from the Proposed Action on In-Kind sites 1 to 5 and 7 to 9 as these sites (parking lots) due not support wildlife populations.

No-Action Alternative

Under the No-Action Alternative, there would be no effects to non-listed wildlife species as construction activities and habitat loss would not occur.

3.3.2.4 Protected Species

Threatened or Endangered Plants Species

A site-specific survey would be conducted for listed plant species that could potentially occur on portions of the Primary or In-Kind sites that would be affected by the Proposed Action. A plan would be developed to avoid, minimize, and mitigate any impacts should listed plant species be found. Mitigation measures may include relocating specific species or protecting portions of the existent population to ensure its long-term survival. Any loss of potential habitat for listed plant species is expected to be minor, given the prevalence of similar habitats on NASA-KSC. Overall, implementation of the Proposed Action has the potential to cause minor impacts to listed plant species on a short and long-term basis.

Threatened or Endangered Wildlife Species

Implementation of the Proposed Action has the potential to cause minor impacts to listed wildlife species. A site-specific survey would be performed for listed wildlife species that could potentially occur on portions of the Primary or In-Kind sites that would be affected by the Proposed Action. If listed species were found, a plan would be developed to avoid, minimize, and mitigate any potential impacts. This would include consultation with NASA-KSC, USFWS, and the FFWCC. Any required permits or authorizations would be obtained prior to start of construction. Impacts to specific species are addressed below.

The American alligator is a mobile species that occurs abundantly throughout waters and wetlands on NASA-KSC. Effects to the alligator are expected to be minor. The alligator could easily relocate to similar adjacent habitats to avoid construction activities. Long-term loss of habitat is minor relative to the overall abundance of suitable wetland and water habitats on NASA-KSC.

The gopher tortoise has potential to occur in the drier habitats that would be affected by the Proposed Action. A thorough gopher tortoise survey would be conducted according to current FFWCC guidelines prior to starting construction. The survey would include marking any burrows and identifying them for protection. If the burrows cannot be avoided by construction then a relocation permit would be obtained to relocate the gopher tortoise and any commensal species (e.g. Florida mouse or gopher frog). An attempt would be made to relocate tortoises a short distance away, out of harm's way, but still within their home range and familiar surroundings. Following construction, tortoises would be allowed to re-inhabit the site on their own, so long-term effects would be negligible.

Impacts to the eastern indigo snake could occur during construction. It is generally expected this species would move out of the way of construction activities on its own. The project would adhere to standard guidelines regarding protection of the indigo snake including educating construction workers about the importance of protecting this species (with signs and training) and stopping construction activities if an indigo snake is observed in the construction limits until the snake has left the area. These short-term effects would be minor. The conversion of natural habitat to an active solar facility could result in a minor long term effect to this species. Given the poor quality of the habitats on the Primary and In-Kind sites to begin with this effect is expected to be minor.

Impacts to wading birds would be minor and temporary. These species may be displaced from foraging on the project sites during construction activities, but there is substantial higher quality foraging habitat for wading birds throughout NASA-KSC to offset this temporary effect. Construction activities would not take place in areas of active wading bird nesting if impacts could occur. The long-term loss of habitat is also considered minor given its poor quality (e.g. infestation with invasive species).

Although no optimal Florida scrub-jay habitat was observed on the Primary or In-Kind sites, mitigation may be required to compensate for loss of the habitat protection zones on these sites resulting from the Proposed Action. A detailed evaluation of these sites would be performed to determine the amount and type of scrub habitat mitigation that would be required to offset these impacts. Consultation with NASA-KSC and USFWS would be included in the assessment as well as adherence to NASA-KSC Scrub-Jay Compensation Plan and USFWS Biological Opinion guidelines or requirements. With the appropriate mitigation, adverse effects are expected to be minor both short and long-term.

Sea turtles are not present on any of the project sites, but their nesting activities on nearby beaches could be affected by exterior lighting. The substation on the Primary site would have minimal lighting for non-routine maintenance that needs to occur at night. Lighting would be installed and operated in compliance with the NASA-KSC's exterior lighting guidelines to avoid impacts to sea turtles.

No-Action Alternative

There would be no effects to threatened and endangered wildlife species under the No-Action Alternative, as there would be no alteration to their habitats.

<u>Bald Eagles</u>

No active or alternate bald eagle nests are located on or within the protection buffer (660 feet [200 m]) of the Primary or In-Kind sites. As such, no effects to eagles are anticipated from the Proposed Action. If an active or alternate nest is found prior to start of construction, then the protective buffer would be implemented between the activities and the nest, or construction would be timed to avoid the nesting season. As such, not effects to the bald eagle would occur from the Proposed Action.

No-Action Alternative

Under the No-Action Alternative, no construction activities would occur and there would be no effect to the bald eagle.

Migratory Birds
Potential impacts to migratory birds because of implementing the Proposed Action at either the Primary site or undeveloped In-Kind sites would be long-term and negligible. Trees located within the site locations would be removed; this would be a minor negative effect to migratory bird species (non-waterfowl). Migratory waterfowl would not be affected by the Proposed Action. However, in terms of area, the approximately 702 acre (284 ha) Primary site and the 165.5 acres (67 ha) of In-Kind sites only account for a miniscule fraction of the available migratory bird habitat located at the NASA-KSC MINWR. Similarly, of the 140,000 acres (56,656 ha) that the NASA-KSC MINWR encompasses, tens of thousands of acres of more suitable upland and wetland (including estuarine for waterfowl) habitats exist for migratory birds. No effect to migratory birds would result for the Proposed Action on the developed In-Kind sites (1 to 5 and 7 to 9).

No-Action Alternative
Under the No-Action Alternative, no construction activities or long-term habitat loss would occur and there would be no effect to migratory birds.

3.4 Cultural Resources

3.4.1 Affected Environment

As of January 2014, NASA-KSC manages 187 archaeological sites and approximately 105 historic buildings, structures or objects, and eight historic districts. None of these resources are on the Primary or 12 In-Kind sites (NASA, 2015a). Also, there are no known historic or archaeological resources potentially eligible for listing on the National Register of Historic Places (NRHP) on the Primary site (NASA, 2017).

Predictive models for archaeological resources, historic context, and historic period archaeological sites across NASA-KSC were prepared by Archaeological Consulting Inc. (ACI) (ACI, 1996 and ACI, 2008). A review of the Historic and Archaeological site probability maps indicates the Primary site and all 12 proposed In-Kind sites are within areas determined to have a low probability of archaeological sites.

There are two historic areas on the Primary site (ACI, 2008). Historic area #87 is located in the northern part of the site. The 1949 U.S. Geological Survey (USGS) maps showed six structures associated with a large orange grove in this location. The 1976 USGS maps did not show the structures, but the groves were still present. Historic area #92 is in the southern part of the Primary site The 1949 USGS maps showed two structures and groves in this general area. According to EBS (NASA, 2017), these structures are no longer extant.

There are two historic areas on In-Kind site 11. Historic area #113 is located in the northern part of In-Kind site 11. One structure was visible on the 1949 USGS maps and 1962 U.S. Air Force aerials at the southeast edge of a citrus grove. Historic area #114 is also in the northern part of In-Kind site 11. The 1949 USGS maps showed six structures and a roadway, associated with a large series of groves. It is unknown whether these structures are still present; however, the entire area is identified as having a low probability for cultural resources.

There are no historic areas located on In-Kind sites 1 to 10 or 12.

3.4.2 Environmental Consequences

All site locations are all located within Low Zones of Archaeological Potential and no archaeological resources are known to occur on the sites. Also, there are no historic sites known to occur on In-Kind sites 1 to 10 and 12. The two historic sites on the Primary site and the two historic sites on In-Kind site 11 are not eligible for inclusion in the National Register of Historic Places or recommended for Phase I archaeological surveys.

As such, the Proposed Action is not expected to result in any effects to cultural resources. Should previously undiscovered artifacts or features be unearthed during any construction of the Projects, work would be stopped in the immediate vicinity of the find, a determination of significance made, and a mitigation plan formulated (NASA, 2016).

No Action Alternative

There would be no effects to cultural resources with No-Action Alternative, as no facilities would be constructed.

3.5 Air Quality

3.5.1 Affected Environment

The ambient air quality at NASA-KSC is mainly affected by daily operations such as vehicle traffic, utilities, fuel combustion, and standard refurbishment and maintenance operations. Other operations that occur infrequently throughout the year, including launches and prescribed fires, affect air quality as episodic events. The primary stationary point sources of air emissions at NASA-KSC are launch vehicle processing, fueling, heating/power plants, generators, incinerators, and storage tanks. Mobile sources include support equipment, commercial transport vehicles, rocket launch vehicles, and personal motor vehicles (NASA, 2015a).

The FDEP classifies NASA-KSC as a Title V major source for the potential to emit for the criteria pollutant nitrogen oxide (NOx), which exceeds the Title V major source threshold of 100-tons per year of NOx. NASA-KSC is classified as a minimal source for carbon monoxide, volatile organic compounds (VOCs), particulate matter, sulfur dioxide, and lead emissions. The NASA-KSC Title V Air Operation Permit 0090051-033-AV provides a list of emission units and insignificant emission units and/or activities.

3.5.2 Environmental Consequences

Construction of the Proposed Action is likely to result in fugitive dust and equipment emissions; however, these emissions would have minor effects to air quality only during the construction time frame. Fugitive dust is particulate emissions released from sources that do not have a point source such as a stack or vent. Examples include hauling, handling or storage of construction materials on site, or dust caused by vehicles traveling over an unpaved road. Windblown soil and dust may also occur during the construction phase because of equipment movement over exposed soil areas. Fugitive dust can be greatly minimized by appropriate dust control measures such as wetting the surfaces and by re-vegetating disturbed areas as soon as possible.

Short-term impacts to the area would be localized and would occur from emissions due to tailpipe emissions from the construction activities (Table 3-10; also see Appendix A). It is anticipated that overall local emissions would return to existing conditions after completion of construction activities. The operation of heavy equipment would have minor, short-term effects on air quality during the construction phase, which is expected to up to ten months. These short-term impacts would be primarily in the form of increased exhaust pollutants that can be minimized by good vehicle maintenance.

Table 3-10. Summary of Emissions from the Construction of Solar PV Facilities

Emission Source	Emissions (Tons)							
	NO_x	SO_2	CO	PM_{10}	$PM_{2.5}$	VOC	CO_2e	Total HAPs
On-road vehicles	0.02	7.80E-05	0.08	5.50E-04	5.00E-04	2.30E-03	10	5.30E-04
Off-road equipment	4.99	0.01	6.78	0.56	0.56	0.92	1,041	0.02
Fugitive dust				271	27.1			
Total	5	0.01	6.86	271	27.6	0.92	1,051	0.02

Notes:
NO_x = nitrogen oxides   VOC = volatile organic compound
SO_2 = sulfur dioxide CO_2e = carbon dioxide equivalent
CO = carbon monoxide   HAP = hazardous air pollutant
PM_{10} = particulate matter with aerodynamic diameter ≤10 µm
$PM_{2.5}$ = particulate matter with an aerodynamic diameter ≤2.5 µm

The Proposed Action would have a beneficial effect on overall long-term air quality due to the absence of CO_2 emissions, which would be typically associated with a traditional power plant. Cumulative effects of this solar project would produce electric power from a non-polluting source, resulting in a small incremental improvement in air quality within the region when compared to burning fossil fuels for electric power.

No-Action Alternative

Under the No-Action Alternative, the PV facilities would not be constructed on NASA-KSC property and the production of renewable solar energy would not occur. Because the facilities would not be constructed and operated, there would be no long-term benefits towards reducing emissions of greenhouse gasses. The approximately 113,785 tons of CO_2 (FPL, 2018) that would be potentially reduced annually as a result of the solar PV facilities would remain a by-product of the operation of a traditional fossil-fueled power plant.

3.6 Climate

3.6.1 Affected Environment

Relatively recent changes in greenhouse gas concentrations (primarily carbon dioxide [CO2]) have been identified as the principal factor influencing earth's current climate trends (Environmental Protection

Agency [EPA], 2009). Human land use changes and burning of fossil fuels for energy are the major contributors to increases in greenhouse gases, which are thought to be accelerating the rate of climate change. Impacts include warmer temperatures, rising sea levels, changes in rainfall patterns, and a host of other associated and often interrelated effects. Increased temperatures have the potential to increase energy use for cooling.

A large portion of NASA-KSC land areas are low-lying, poorly drained, and vulnerable to inundation by periodic storm events. These low-lying areas are vulnerable to the effects of global climate change, including sea level rise, in future decades. These changes represent an increased risk to NASA-KSC operations associated with construction projects, launch processing, fueling operations, land management, and other work conducted outdoors (NASA, 2015a).

3.6.2 Environmental Consequences

The Proposed Action will have a long-term beneficial effect on the climate, by indirectly reducing greenhouse gases and other air emissions that contribute to climate change and sea level rise. FPL (2018), anticipates approximately 113,785 tons of CO_2 would be potentially reduced annually by displacing the need for operation of traditional fossil-fueled power plants.

No Action Alternative

Under the No-Action Alternative, the PV facilities would not be constructed on NASA-KSC property and the production of renewable solar energy would not occur. Because the facilities would not be constructed and operated, there would be no long-term benefits towards reducing emissions of greenhouse gasses. The approximately 113,785 tons of CO_2 (FPL, 2018) that would be potentially reduced annually as a result of the solar PV facilities would remain a by-product of the operation of a traditional fossil-fueled power plant

3.7 Hazardous Materials and Waste

3.7.1 Affected Environment

NASA has developed a program of managing and handling hazardous and controlled wastes at NASA-KSC. The organizational and procedural requirements of the NASA-KSC hazardous waste management program are contained in KNPR 8500.1 NASA-KSC Environmental Requirements and EVS-P-0001 Spaceport Waste Services Guidance Manual (NASA, 2015a). These programs include identification and corrective actions to address hazardous materials regulated under the Resource Conservation and Recovery Act (RCRA) and its Hazardous and Solid Waste Amendments. NASA-KSC's remediation group also manages petroleum contamination sites. To date, NASA has identified and investigated approximately 108 Solid Waste Management Units (SWMU) sites and 227 Potential Release Locations (PRLs), of which 93 still require further investigation to confirm the presence or absence of contamination.

No hazardous wastes are currently generated on the Primary site or In-Kind sites. Historic agricultural activities on the Primary site included storing and mixing of pesticides and herbicides as well as storage of petroleum products and diesel fuel. NASA-KSC's environmental baseline study of the Primary site (NASA, 2017) identified potentially hazardous materials onsite, including a partially used drum of Diluent Blue, which is a petroleum hydrocarbon dye substance used with herbicides, and diesel fuel tanks containing up to 1,117 l (295 gal) of fuel, a diesel engine with crankcase oil, and a lead acid battery. One SWMU and three PRLs were investigated within the boundary of the Primary site in support of the NASA Hazardous and Solid Waste Amendments permit requirements. No Further Action (NFA) recommendations were issued for all four sites. Three additional PRL's were investigated in the vicinity of the Primary site and all three are recommended as NFA.

There is a doubled walled above ground 295-gallon (1,117 liter) diesel tank located at Pump House 11 at the southern boundary of the Primary site. This tank was installed in 2009 and is inspected as required by NASA-KSC's Spill Prevention and Countermeasure Control (SPCC) Plans (KSC-PLN-1919 and 1920) (NASA, 2017).

There are several remediation sites in the vicinity of the In-Kind sites, which are identified in Table 3-11. There are no active sampling locations on any of the sites.

Table 3-11. Remediation Sites in the Vicinity of the 12 In-Kind Sites

Site ID	Description	Status	In-Kind Site
SWMU 080	Former Saturn V Rocket Display	No Further Action	3
PRL 070	Operations Support Building - Cooling Tower Discharge	No Further Action	2
PRL 106	Multi-Payload Processing Facility, M7-1104	No Further Action	10
PRL 159	Weather Equipment Building 509, L6-75	No Further Action	6
SWMU 004	Orsino Storage Yard (M6-895)	Implementing a Remedial Action Plan or Natural Attenuation with Monitoring Plan	10
SWMU 056	Mobile Launch Platform Park Sites/Vehicle Assembly Building (VAB) Area	Ongoing remediation and monitoring; no contamination "hot spots" at the In-Kind sites; recommended no further monitoring at groundwater wells closest to In-Kind sites (3, 4, 5) because results have been below groundwater cleanup target level for at least two consecutive sampling events[1]	1, 3, 4, 5
SWMU 104	KSC Headquarters Building Area, which is located south of In-Kind site 7 and north of In-Kind sites 8 and 9	Ongoing remediation and monitoring for PCB's; no monitoring wells on In-Kind sites	7, 8, 9
SWMU 108	Mission Support Building Area	Included in VAB monitoring program; sampling not planned to occur on In-Kind sites	4, 5
PRL 174	Area 2 Repeater Buildings	Areas of concern have been mitigated for human health and	2

Table 3-11. Remediation Sites in the Vicinity of the 12 In-Kind Sites			
Site ID	**Description**	**Status**	**In-Kind Site**
		safety or sampling has confirmed no exceedances are present.	
PRL 205	Radar Wind Profiler Site C – used to house equipment for weather and wind monitoring; six areas of concern; potential contaminants include hydro carbons, solvents, and metals	Confirmation sampling is planned to start in August 2018	6
PRL 225	Jerome Road storage building, located north east of In-Kind site 11 potential concern for groundwater contamination for solvents and hydrocarbons	Confirmation sampling is planned to start in August 2018	11
PRL 227	Stand Alone Electrical Equipment – load break switches in two locations near In-Kind site 10 have potential contaminants: hydrocarbons and PCBs	Confirmation sampling is planned to start in August 2018	10

[1]Source: NASA, 2016.

3.7.2 Environmental Consequences

During construction, the potential for environmental effects from hazardous materials or waste as a result of the Proposed Action would be negligible and exists only as a result of a malfunction of or inadvertent damage to construction vehicles or equipment (in the form of petroleum spills). The likelihood of this is very small; however, should an unexpected spill occur, all hazardous wastes would be handled in accordance with KNPR 8500.1 NASA-KSC Environmental Requirements and NASA-KSC site-specific Spill Prevention and Countermeasure (SPCC) plan that would be developed. All construction or maintenance workers will be provided training on NASA-KSC environmental requirements and procedures, including reporting requirements to minimize the potential risk of release of hazardous materials.

Pesticides would be not used for maintenance. Herbicides (such as Roundup®) may be used for spot treatment and in accordance with the manufacturer's instructions. The solar PV panels would not contain any hazardous materials and any broken panels would be disposed of in accordance with applicable regulations. The transformers would contain mineral oil. A site-specific SPCC plan would be developed and implemented to address proper containment and clean up measures in the event of an unexpected leak or spill. Overall, any effects to hazardous materials or waste from the Proposed Action would be negligible.

The Proposed Action, including construction and operation, is not expected to affect the NASA-KSC Remediation Program's plans for managing SWMU and PRL sites or interfere with ongoing investigations at these sites. There are no active monitoring wells on the Primary or In-Kind sites.

No-Action Alternative

Under the No-Action Alternative, there would be no potential for environmental effects from hazardous materials or waste because the Proposed Action would not be implemented.

3.8 Water Resources

3.8.1 Affected Environment

3.8.1.1 Surface Water

Fresh surface waters within NASA-KSC are primarily derived from the surficial groundwater, which is recharged by rainfall (NASA, 2015a). Shallow groundwater supports numerous freshwater wetlands. During most of the year, shallow groundwater discharges to swales and canals (Schmalzer and Hinkle 1990a). Many of the larger canals are excavated below the groundwater table and, as a result, always contain water.

There are no natural water bodies or surface waters on the Primary site. Natural water flows into interior ditches and then into a large canal parallel to NASA Parkway West. Water in this canal drains west towards the Indian River. There is an unmaintained, agricultural drainage system on the Primary site, which was constructed to manage water levels within the citrus groves. This system includes numerous ditches throughout the site located along access roads and through former citrus groves. These ditches are not maintained and are largely overgrown with Brazilian pepper and Australian pine. The drainage system was previously served by three pumps, of which only one remains. This pump is located along the southern boundary of the Primary site and moves water into the drainage canal along NASA Parkway West. It is not currently used to control flooding and is not likely to be effective given the degraded condition of the unmaintained ditch system (NASA, 2017). Two small man-made ponds on the Primary site were likely constructed for the citrus grove operations.

There are no natural waterbodies or surface waters on any of the 12 In-Kind sites. Interior drainage swales and roadside ditches are present on In-Kind sites 6, 10, 11, and 12. There are no surface water resources present on the developed In-Kind sites 1 to 5 and 7 to 9.

3.8.1.2 Floodplains

Due to its low elevation and proximity to the coast, much of NASA-KSC falls within both the 100- and 500-year floodplains established by the Federal Emergency Management Agency (FEMA), National Flood Hazard Layer (NFHL), which has published Flood Insurance Rate Maps for Brevard County (PEIS, 2016 and FEMA, 2018). Figure 3-4 shows the Primary and In-Kind sites overlain on the 100 year floodplain as mapped by FEMA.

Much of the western side of the Primary site is located within the 100-year floodplain (Zone AE) of the Indian River, located approximately 2.4 miles (3.9 km) west of the Primary site's western boundary. Scattered portions of In-Kind sites 11 and 12 are also mapped within the 100-year floodplain of the Indian River. The other In-Kind sites (1 to 10) are outside of the 100-year floodplain.

3.8.1.3 Groundwater

NASA-KSC is a relatively flat, coastal area with a shallow water table. Nearly all groundwater at NASA-KSC originates as precipitation that infiltrates through soil into flow systems in the underlying hydrogeologic units. Of the approximate 55 in (140 cm) of precipitation annually, approximately 75 percent is claimed by evapotranspiration. The remainder is accounted for by runoff, base flow, and recharge of the Surficial Aquifer (NASA, 2015a).

Groundwater on the Primary site and In-Kind sites 6, 11 and 12 generally flows west in the direction of the Indian River. Drainage is to the east towards the Banana River for In-Kind sites 1 to 5, and 7 to 10. The depth to the water table in this area ranges from 1.4 to 8 ft (0.5 to 2.4 m) below land surface. Site-specific groundwater flow direction is expected to mimic site topography. Local features such as the location of drainage ditches would influence groundwater flow direction; therefore, a hydrogeologic investigation would be required to determine site-specific groundwater flow direction at any of the sites.

3.8.2 Environmental Consequences

3.8.2.1 Surface Water

The Proposed Action would be designed and constructed in accordance with all state and federal regulations and any necessary permits for activities in surface waters would be obtained prior to construction. Permits likely to be needed for construction include an ERP and NPDES stormwater construction permit from FDEP and a Section 404 wetland permit from the USCAE.

To the extent possible, the Proposed Action will be designed to maintain the same or improve the existing drainage systems at the Primary site and In-Kind sites. Depending on the final site layout, it is possible that some of the interior man-made drainage ditches may be filled, regraded or otherwise modified to allow for a feasible layout of the solar facilities or associated infrastructure (i.e. stormwater management facilities, access roads, etc.). Since the proposed development footprint is considerably smaller than the overall Primary site, these impacts would be avoided and then minimized to the extent possible and are anticipated to be minor and long-term. Man-made ditches on the undeveloped In-Kind sites 6 and 10 to 12 may also be slightly modified to accommodate the PV facilities if needed. Effects resulting from this are anticipated to be minor.

FPL will prepare a site-specific stormwater pollution prevention plan (SWPPP) that would be implemented during construction to control erosion and sedimentation into surrounding wetlands and surface waters. Inspections would be performed throughout construction to ensure the erosion control devices are being maintained and are operating effectively. Impacts to surface water resources during construction are expected to be short-term and minor.

The ground surface underneath the solar panels would be mostly vegetated. Long-term maintenance of the site vegetation would primarily be done by mowing. Herbicides (such as Roundup®) may be used sparingly and in accordance with the manufacturer's instructions, if needed. Panel washing for the solar PV facilities is not needed. Any adverse effects to surface waters on the Primary or undeveloped In-Kind sites are expected to be minor and long-term. There will be no effect to surface water on the developed In-Kind sites.

No-Action Alternative

Under the No-Action Alternative, there would be no effects to surface water and drainage because the Proposed Action would not be implemented.

3.8.2.2 Floodplains

Construction in the 100-year floodplain on the Primary site and In-Kind sites 11 and 12 would be avoided to the extent possible and unavoidable impacts to floodplains would be compensated for in accordance with state and federal regulations to ensure no adverse flooding effects occur to adjacent properties. Groundcover beneath the solar PV arrays would be pervious, which would allow water to infiltrate similar to the pre-construction condition. Overall, effects to the floodplain from the Proposed Action on the Primary site or In-Kind sites 11 and 12 are expected to be long-term and minor. No effects to floodplains would occur to In-Kind sites 1 to 10, as these sites are outside of the 100-year floodplain.

No-Action Alternative

Under the No-Action Alternative, there would be no effect to floodplains, as the Proposed Action would not be implemented.

3.8.2.3 Groundwater

Limited temporary dewatering may be needed during construction to allow for a dry work area for activities such as trenching of electrical conduits or construction of the stormwater management system. If needed, dewatering would be accomplished using standard approved techniques (e.g. well points) and would be done in accordance with state requirements. Effects from dewatering would be minor and short-term. The Proposed Action would not affect groundwater resources on a long-term bases and no groundwater water withdrawals or discharges would be needed.

No-Action Alternative

Under the No-Action Alternative, there would be no effect to groundwater resources as no construction dewatering would be needed.

3.9 Geology and Soils

NASA-KSC landscape was formed from repeated cycles of erosion and deposition under conditions of rising and receding sea levels. The ensuing cycle of erosion and deposition resulted in a current surface strata of primarily unconsolidated white to brown quartz sand containing beds of sandy coquina (NASA, 2015a). Multiple dune ridges interspersed with low-lying areas represent successive stages in this growth. The western portion of Merritt Island is substantially older than the east, and erosion has reduced the western side to a nearly level plain. Detailed discussions of geology and soils at NASA-KSC are available in the NASA-KSC PEIS (NASA, 2016) and ERD (NASA, 2015a).

3.9.1 Affected Environment

The soils on NASA-KSC were mapped by the Soil Conservation Service (now the U.S. Department of Agriculture [USDA], Natural Resources Conservation Service [NRCS]) and its Florida partners in the soil surveys for Brevard and Volusia Counties. Fifty-eight soil series and soil associations occur at NASA-KSC (NASA, 2015a). Soil types mapped on the Primary site and undeveloped In-Kind sites: 6 and 10 to 12 are shown on Figure 3-4 and are listed in Table 3-12 by site, soil type, drainage class, hydric rating, and areal coverage. A description of each soil type is provided after the table.

Table 3-12. Soil Types Mapped on the Primary and Undeveloped In-Kind Sites

Site	Map Unit Symbol	Soil Name	Drainage Class	Hydric Rating	Acres	Ha	% of Site
Primary Site	2	Anclote sand, frequently ponded, 0 to 1 percent slopes	VPD	Yes	19.75	7.99	3%
	3	Anclote sand, frequently flooded	VPD	Yes	10.70	4.33	2%
	6	Basinger sand, depressional	VPD	Yes	1.75	0.71	0%
	7	Basinger sand	PD	Yes	7.94	3.21	1%
	8	Bradenton fine sand, limestone substratum	PD	No	46.89	18.98	7%
	13	Chobee mucky loamy fine sand, depressional	VPD	Yes	5.85	2.37	1%
	16	Copeland-Bradenton-Wabasso complex, limestone substratum	VPD	Yes	65.09	26.34	9%
	19	Riviera sand, 0 to 2 percent slopes	PD	Yes	67.28	27.23	10%
	21	Riviera and Winder soils, depressional	VPD	Yes	80.29	32.49	11%
	36	Myakka sand, 0 to 2 percent slopes	PD	No	3.41	1.38	0%
	52	Quartzipsamments, smoothed	MWD	No	9.29	3.76	1%
	54	St. Johns sand, 0 to 2 percent slopes	PD	Yes	4.98	2.01	1%
	71	Wabasso sand, 0 to 2 percent slopes	PD	No	378.56	153.20	54%
	99	Water	-	-	0.01	0.00	0%
				Nonhydric Subtotal	**438.16**	**177.32**	**62%**
				Hydric Subtotal	**263.64**	**106.69**	**38%**
				Total	**701.81**	**284.01**	**100%**
In-Kind Site 6	8	Bradenton fine sand, limestone substratum	PD	No	12.65	5.12	26%
	16	Copeland-Bradenton-Wabasso complex, limestone substratum	VPD	Yes	31.11	12.59	63%
	19	Riviera sand, 0 to 2 percent slopes	PD	Yes	0.94	0.38	2%
	28	Immokalee sand, 0 to 2 percent slopes	PD	No	4.71	1.90	10%
	52	Quartzipsamments, smoothed	MWD	No	0.02	0.01	0%
				Nonhydric Subtotal	**17.37**	**7.03**	**35%**

Table 3-12. Soil Types Mapped on the Primary and Undeveloped In-Kind Sites							
Site	Map Unit Symbol	Soil Name	Drainage Class	Hydric Rating	Acres	Ha	% of Site
				Hydric Subtotal	**32.05**	**12.97**	**65%**
				Total	**49.43**	**20.00**	**100%**
In-Kind Site 10	20	Riviera and Winder soils	PD	Yes	4.99	2.02	17%
	28	Immokalee sand, 0 to 2 percent slopes	PD	No	22.07	8.93	76%
	91	Anclote sand	PD	Yes	1.89	0.76	7%
				Nonhydric Subtotal	**22.07**	**8.93**	**76%**
				Hydric Subtotal	**6.87**	**2.78**	**24%**
				Total	**28.94**	**11.71**	**100%**
In-Kind Site 11	8	Bradenton fine sand, limestone substratum	PD	No	10.27	4.16	59%
	16	Copeland-Bradenton-Wabasso complex, limestone substratum	VPD	Yes	0.40	0.16	2%
	36	Myakka sand, 0 to 2 percent slopes	PD	No	0.61	0.25	3%
	71	Wabasso sand, 0 to 2 percent slopes	PD	No	6.20	2.51	35%
				Nonhydric Subtotal	**17.09**	**6.92**	**98%**
				Hydric Subtotal	**0.40**	**0.16**	**2%**
				Total	**17.50**	**7.08**	**100%**
In-Kind Site 12	8	Bradenton fine sand, limestone substratum	PD	No	6.11	2.47	13%
	16	Copeland-Bradenton-Wabasso complex, limestone substratum	VPD	Yes	40.71	16.47	85%
	36	Myakka sand, 0 to 2 percent slopes	PD	No	1.06	0.43	2%
				Nonhydric Subtotal	**7.17**	**2.90**	**15%**
				Hydric Subtotal	**40.71**	**16.47**	**85%**
				Total	**47.88**	**19.37**	**100%**

Source: USDA, NRCS, 2017.
Notes:
MWD = Moderately well drained; PD = Poorly drained; VPD = Very poorly drained

Nonhydric Soil Descriptions

Bradenton fine sand (limestone substrate) consists of nearly level, poorly drained, sandy soils found on low ridges and floodplains. They formed in sandy and loamy marine sediments over limestone. The underlying limestone layer is porous, and water moves through it freely. For most years, the water table is within 10 in (25 cm) of land surface for 2 to 6 months, and the soil is flooded 2 to 7 times once every 1 to 5 years.

Immokalee sand (0 to 2 percent slope) consists of nearly level, poorly drained to very poorly drained sands found in flatwoods, scrub, low ridges between sloughs, and in narrow areas between sand ridges and lakes or ponds. The depth to the seasonal high water table is within 6 to 8 in (15 to 20 cm) of the surface for 1 to 4 months during most years, 18 to 36 in (46 to 91 cm) for 2 to 10 months during most years, and it is below 60 in (152 cm) during extended dry periods. Depressional phases are ponded 0 to 12 in (30 cm) for 6 to 9 months each year.

Myakka sand (0 to 2 percent slope) consists of nearly level, poorly drained soils on broad areas in flatwoods and in areas between sand ridges and ponds and sloughs. They formed in sandy marine deposits. In most years, the water table is within 10 in (25 cm) for 1 to 4 months and between 10 to 40 in (25 to 102 cm) for more than 6 months. In dry seasons, it is below a depth of 40 in (102 cm). The soil is flooded for 2 to 7 days one in 1 to 5 years.

Quartzipsamments (smooth) consists of nearly level to steep sandy soils that have been reworked and shaped by earthmoving equipment. Soil material is derived from a variety of sandy soils. Drainage is variable and site specific.

Wabasso sand (0 to 2 percent) consists of nearly level, poorly drained soils on broad areas in the flatwoods and on low ridges on floodplains. These soils formed in sandy marine sediments over loamy materials. Permeability is rapid to a depth of about 28 in (71 cm) and moderate between 28 to 62 in (71 to 157 cm). Groundwater is typically within 30 in (76 cm) of the surface most years and within 10 in (25 cm) for 1 to 2 months of the year. Flooding occurs periodically (2 to 7 times in a 1 to 5 year interval).

Hydric Soil Descriptions

The Anclote series, including **Anclote sand, Anclote sand (frequently ponded, 0 to 1 percent slopes), and Anclote sand (frequently flooded)**, consists of nearly level, very poorly drained sandy soils found in marshy depressions in flatwoods, broad areas on floodplains, and in poorly defined drainageways. They formed in sandy marine sediments. In most years, the water table is within 10 in (25 cm) of the ground surface for more than 6 months of the year.

The Basinger series including **Basinger sand and Basinger sand (depressional)** consists of nearly level, poorly drained sand sandy soils in sloughs of poorly defined drainageways and depressions in flatwoods. The soils formed in sandy marine sediments. It is occasionally flooded for 2 to 7 days following heavy rains. In most years, the water table is within a depth of 10 in (25 cm) for 2 to 6 months of the year and 10 to 40 in (25 to 102 cm) for 6 months or more.

Chobee mucky loamy fine sand consists of very deep, very poorly drained soils on flatwoods in depressions, drainageways, low broad flats, and floodplains. They formed in thick beds of loamy marine sediments. Depth to the seasonal high water table is 0 to 6 in (15 cm) of the surface for about 4 months during most years, and within 6 to 12 in (15 to 30 cm) most of the rest of the year. Ponding of 0 to 12 in (30 cm) can occur for up to 30 days.

Copeland-Bradenton-Wabasso Complex consists of several nearly level, very poorly drained soils on low flats associated with pinelands and mixed cabbage palm-hardwood hammocks. They formed in moderately thick beds of sandy and loamy marine sediments over limestone. In most years, the water table is within a depth of 10 in (25 cm) for more than 6 months. Short duration flooding events (1 to 7 days) may occur annually with longer duration flooding (up to 30 days) occurring eve ry 5 to 20 years.

The Riviera series, including **Riviera sand (0 to 2 percent slopes), Riviera and Winder soils, and Riviera and Winder soils (depressional)** consists of nearly level, poorly to very poorly drained sandy soils on broad low flats and in sloughs, drainage ways, depressions, pine flatwoods, hardwood hammocks and impounded marsh. These soils formed in stratified layers of sandy and loamy marine deposits. Permeability is rapid within sandy layers and moderate to moderately rapid in the loamy layers. Groundwater elevation is highly variable, but is typically within 10 in (25 cm) of land surface for up to 6 months each year, with periodic flooding during about 3 months of the year for Riviera and Winder soils, and continuous flooding for 6 or more months of the year for Riviera and Winder soils (depressional).

St. Johns sand (0 to 2 percent slopes) consists of nearly level, poorly drained sand on broad low ridges in flatwoods. These soils formed in marine sands. The water table is within a depth of 10 in (25 cm) for 2 to 6 months in most years and typically 10 to 40 in (25 to 102 cm) the rest of the time. During extended dry periods, it is below 40 in (102 cm) and is occasionally flooded for 2 to 7 days following heavy rains.

3.9.1.1 Primary Site

According to the Brevard County Soil Survey (USDA, 1974) and the NRCS webviewer (NRCS, 2018), the Primary site contains nine distinct soils series, one complex, and one association as listed in Table 3-10 The dominant soils include Wabasso sand (54 percent), Riviera and Riviera and Winder soils (21 percent), Copeland-Bradenon-Wabasso complex (9 percent), and Bradenton fine sand (7 percent). Other mapped soils, each representing 2 percent or less of the Primary site, include Anclote sand, Basinger sand, Chobee mucky loamy fine sand, Myakka sand, Quartzipsamments, and St. Johns sand.

Ninety-nine percent of the soils on the Primary site are classified as poorly or very poorly drained and 38 percent have a hydric rating. Construction of drainage ditches and bedding made some of these hydric soil areas suitable for citrus. However, prior to site alteration and drainage to accommodate citrus production, the naturally occurring plant communities typically found on these soils would have included wetland-adapted species that tolerate periodic root inundation and anoxia (NASA, 2017).

3.9.1.2 In-Kind Sites

Developed In-Kind Sites: 1 to 5 and 7 to 9

Soils on the developed sites are covered by pavement and classified as Urban Land. This classification consists of areas that are 60 to more than 75 percent covered with streets, buildings, large parking lots, shopping centers, industrial parks, airports, and related facilities.

Undeveloped In-Kind Sites: 6 and 10 to 12

There are four distinct soil series and one complex mapped on In-Kind site 6. The Copeland complex is the most prevalent, accounting for 63 percent of the site. Bradenton find sand comprises 26 percent, followed by Immokalee sand (10 percent), Riviera sand (2 percent), and Quartzipamments (less than 1 percent). Similar to the Primary site, 99 percent of the soils are classified as poorly or very poorly drained; 65 percent of the soils mapped on In-Kind site 6 have a hydric rating. An extensive agricultural ditch system developed to drain water from the site during its historic use for citrus production is likely to have drained the soils and modified their hydric characteristics.

In-Kind site 10 consists of three poorly drained soil types. Immokalee sand (0 to 2 percent slopes) is most prevalent (76 percent), followed by Riviera and Winder soils (17 percent), and Anclote sand (7 percent). Approximately 24 percent of In-Kind site 10 is underlain with hydric soils. Several man-made drainages traverse or are adjacent to the site and are likely to have modified the hydric characteristics of the soils within their area of influence.

In-Kind site 11 is comprised of three poorly drained, nonhydric soils: Bradenton fine sand (limestone substratum), Myakka sand (0 to 2 percent slopes), and Wabasso sand (0 to 2 percent slopes) that combined cover 98 percent of the site. The only hydric soil mapped on the site is Copeland-Bradenton-Wabasso complex (limestone substratum); it accounts for 2 percent In-Kind site 11.

In-Kind site 12 is primarily comprised (85 percent) of the very poorly drained hydric soil: Copeland-Bradenton-Wabasso complex (limestone substratum). Nonhydric soil types account for 15 percent of the site and include Bradenton fine sand (limestone substratum) and Myakka sand (0 to 2 percent slopes). Similar to the other sites formerly cultivated in citrus, agricultural drainage ditches across this site are likely to have modified the hydric characteristics of the soils within their zone of influence.

3.9.2 Environmental Consequences

Potential impacts to soils from implementing the Proposed Action on the Primary site and the undeveloped In-Kind sites would be minor and long-term. Impacts to soils are likely to result from vehicular and equipment traffic, clearing and grading, installation of the racking system for the solar PV arrays, and the trenching and burying of the associated collection conduits. Following construction, the soils will be replaced to their original location to the extent possible. The addition of semi-impervious surfaces will be limited to at-grade access paths, so effects to the overall pervious nature of each site would be minor.

There would be no effect to soils on the developed In-Kind sites (1 to 5 and 7 to 9) as these sites are already paved.

No-Action Alternative

No effects to soils would be expected under the No-Action Alternative, as the Proposed Action would not be implemented.

3.10 Transportation

3.10.1 Affected Environment

NASA-KSC is serviced by over 211 mi (340 km) of roadway with 163 mi (263 km) of paved roads and 48 mi (77 km) of unpaved roads. NASA Parkway West (SR 405) is the main access road for cargo, tourists, and personnel entering and leaving NASA-KSC and is a four-lane highway. Kennedy Parkway (SR 3) is the major north-south artery for NASA-KSC and is a four-lane highway. All roads to NASA-KSC have control access points, which are manned 24 hours per day, seven days per week (NASA, 2015a).

The Primary site is situated just north of NASA Parkway West (SR 405), but is only accessible from Roberts Road, which is an unpaved access road that extends west through the site from Kennedy Parkway (SR

3). There are several unnamed, unpaved access roads on the Primary site. Most of these roads are not maintained, are overgrown with vegetation, and are inaccessible to vehicular traffic.

All 12 In-Kind sites are accessible from paved roads. In-Kind sites 1 to 5 are accessible from Kennedy Parkway (SR 3) and Saturn Causeway. In-Kind site 6 is accessible from Schwartz Road. In-Kind site 7 is accessible from C Avenue Southeast, 1st Street, or D Avenue Southeast. In-Kind sites 8 and 9 are accessible from 2nd and 3rd Streets, C Avenue Southeast, and D Avenue Southeast. In-Kind site 10 is accessible from 5th Street, D Avenue Southeast, and Avenue East. In-Kind sites 11 and 12 are accessible from Kennedy Parkway (SR 3) and McGruder Road.

3.10.2 Environmental Consequences

Development of new access roads to the Primary or In-Kind sites would not be needed for the Proposed Action as there is adequate site access to all sites. During construction, a negligible increase in traffic may occur due to the need to transport equipment and workers to the sites. Operation and maintenance of the solar PV facility would require occasional maintenance from a small crew, resulting in a negligible effect to traffic over the lifetime of the project.

No-Action Alternative

No effects to transportation would be expected under the No-Action Alternative, as the Proposed Action would not be implemented.

3.11 Utilities

3.11.1 Affected Environment

3.11.1.1 Drinking Water

No facilities are served by potable water on the Primary site or the 12 In-kind sites. According to the EBS (NASA, 2017), known artesian wells used as water supply for agriculture and potable water on the Primary site have been abandoned in compliance with regulations; however, it is possible additional unknown wells exist on the Primary site. The nearest potable water mains are located along Kennedy Parkway (SR 3) and NASA Parkway (SR 405).

3.11.1.2 Domestic and Industrial Wastewater

According to the EBS (NASA, 2017), domestic wastewater at NASA-KSC is managed by a collection and transmission system pumping to two major regional lift stations, Sewage Treatment Plant (STP)-1 and STP-4, and then to the Cape Canaveral Regional Wastewater Treatment Facility. Septic tanks or chemical toilets are used in areas on NASA-KSC where sewer service is not available. There are no wastewater services on the Primary or 12 In-Kind sites. However, it is possible there are relic septic tanks or other wastewater disposal systems on the Primary site due to the previous residential structures.

3.11.1.3 Stormwater

Stormwater on the Primary site is carried through man-made drainage ditches that discharge into the canal along the southern border of the site (along NASA Parkway) and flows west into the Indian River. Stormwater on In-Kind sites 6, 11, and 12 also drain into man-made ditches that flow west into the Indian River. Drainage associated with the developed portions of the In-Kind sites is accounted for as part of the NASA-KSC Regional Stormwater Treatment System. Stormwater from In-Kind sites 1 to 5 and 7 to 10 drain east towards the Banana River.

3.11.1.4 Solid Waste

Solid waste is not generated or disposed of on the Primary site or 12 In-Kind sites.

3.11.1.5 Electrical

The electrical power for NASA-KSC is purchased from FPL at 115 kV and stepped down to 13.8 kV at two locations to serve NASA-KSC. NASA-KSC owns and maintains the 13.8 kV medium voltage distribution system throughout NASA-KSC. FPL and NASA have a unique public-private partnership to provide clean, renewable power to Florida residents and to support America's space program by supplying electricity directly to NASA-KSC. An FPL solar array located in the southern portion of NASA-KSC (adjacent to In-Kind sites 11 and 12) produces an estimated 10 megawatts of clean, emissions-free power for FPL customers, which is equivalent to serving approximately 1,100 homes. A separate 1 MW solar facility located in the Industrial Area provides clean power directly to NASA-KSC and is helping NASA meet its renewable energy goals. The Proposed Action is an example of the continuing partnership between NASA-KSC and FPL to produce clean energy from renewable resources.

3.11.2 Environmental Consequences

3.11.2.1 Drinking Water

A drinking water supply is not required for the Proposed Action on the Primary or In-Kind sites. Employees will not be housed or stationed at the PV facilities and any water needed for maintenance (or landscaping) activities would be brought in by a water truck. Therefore, there would be no effect upon NASA-KSC potable water facilities from the Proposed Action.

No-Action Alternative

No effects to drinking water would be expected under the No-Action Alternative, as the Proposed Action would not be implemented.

3.11.2.2 Domestic and Industrial Wastewater

Wastewater and sewage would not be generated by the Proposed Action. As such, there will be no effect to domestic or industrial wastewater facilities at NASA-KSC.

No-Action Alternative

No effects to domestic or industrial water would be expected under the No-Action Alternative, as the Proposed Action would not be implemented.

3.11.2.3 Stormwater

Effects to stormwater during construction are expected to be minor and short term. FPL would prepare a site-specific SWPPP to manage stormwater flows, sedimentation, and erosion during construction. Also, an NPDES construction stormwater discharge permit would be obtained by FDEP prior to starting construction on any of the sites. All permit conditions will be followed throughout the construction process, including installation and maintenance of erosion control devices, sampling and monitoring, and reporting requirements.

Impervious areas constructed after 1992 are subject to the FAC and requirements of the FDEP to provide for the treatment of pollutants and the attenuation of potential flooding impacts. As facilities are improved or built, stormwater systems must be built or upgraded to be consistent with the state requirements. FPL will design stormwater management facilities to accommodate the PV facilities on the Primary site and undeveloped In-Kind sites (6, 10, 11, and 12) to meet state requirements and will obtain an ERP for these facilities prior to starting construction. All permit conditions will be adhered to during operation of the facilities. This includes routine monitoring and maintenance of the facilities to ensure they are properly functioning. Long-term effects to stormwater from the Proposed Action are expected to be negligible.

No-Action Alternative

No effects to stormwater would be expected under the No-Action Alternative, as the Proposed Action would not be implemented.

3.11.2.4 Solid Waste

The Proposed Action would result in some solid waste generation (primarily packing materials and some scrap wire), during assembly of the solar PV panels on the Primary and In-Kind sites. However, these materials would be removed from NASA-KSC and would be disposed of in accordance with state and federal regulations. If possible, recycling of wasted materials would occur. These impacts would be minor and short term.

Minor amounts of solid waste may be generated by cleaning or maintenance activities on an intermittent basis. Long-term negligible effects may result from implementation of the Proposed Action.

No-Action Alternative

No effects to solid waste would be expected under the No-Action Alternative, as the Proposed Action would not be implemented and no solid waste would be generated.

3.11.2.5 Electrical

FPL's solar facilities are built cost-effectively and there is no net cost to customers after savings from fuel and other generation-related expenses over the life of the project. The In-Kind solar projects built for NASA-KSC, the sole recipient of the power generated by the In-Kind projects, would reduce NASA-KSC's electricity costs. Therefore, the Proposed Action would have a minor, long-term beneficial effect.

No-Action Alternative

Under the No-Action Alternative, there would be no effects to current electricity generation or usage because the Proposed Action would not be implemented. Solar power would not contribute to NASA-NASA-KSC's power availability or be available to the general power grid in the surrounding region. Utility systems would continue to age and would require upgrades or replacements as they become less efficient or fail. However, current utility systems and their configuration at NASA-KSC would remain relatively unchanged aside from regular maintenance for the duration of the 20-year planning horizon (2012-2032) (NASA, 2016).

3.12 Public Health and Safety

3.12.1 Affected Environment

According to the ERD (NASA, 2015a), an Occupational Health Facility and an Emergency Aid Clinic provide medical services to NASA-KSC. The clinic employs medical personnel specially trained in the hazards and treatment associated with the facilities and operations at NASA-KSC and has equipped to provide first-care treatment of injuries. Ambulance service and a medically equipped helicopter are available to transfer injured personnel to full care medical facilities in the region.

NASA-KSC has internal security operations, which include access control, personnel identification, traffic control, law enforcement, investigations, classified material control, and natural resource protection. The security forces maintain road access control gates and patrol the NASA-KSC perimeter boundary (NASA, 2015a)

NASA-KSC has a comprehensive program of fire protection engineering, fire prevention, fire suppression and emergency response operations. Specialized equipment and training, suited to the potential fire and emergency hazards of operations at NASA-KSC are provided. Three fire stations on NASA-KSC provide effective coverage to all of NASA-KSC.

3.12.2 Environmental Consequences

Potential adverse effects to human health and safety could occur during construction or maintenance activities for the Proposed Action. Construction and maintenance workers would be required to comply with Occupational Safety and Health Administration (OSHA) regulations, other recognized standards, and applicable NASA regulations or instructions prescribed for the control and safety of personnel and visitors to the job site. Implementation of these measure should minimize the potential for adverse effects to health and safety.

An overall benefit to public health would occur from implementation of the Proposed Action from reducing air emissions from the conventional fossil fuel power generation the Proposed Action would displace. The beneficial effect is expected to be minor and long-term.

No-Action Alternative

Under the No-Action Alternative, there would be no adverse or positive effects to human health or safety. There would be no potential for injuries or safety violations as no activities would occur. There would be no positive benefit to human health from the reduction of air emissions.

3.13 Socioeconomics

3.13.1 Affected Environment

A detailed overview of the current socioeconomic conditions for both the NASA-KSC vicinity and the state of Florida is provided in the NASA-KSC PEIS (NASA, 2016). NASA-KSC is one of Brevard County's largest employers and a major sources of revenue for local businesses; as such, it has as a substantial economic effect throughout the region. NASA-KSC is directly and indirectly involved in many Florida industries that supply goods and services to the space program and various other NASA projects. Additionally, NASA-KSC supports two industries generated by NASA-KSC's own resources: agriculture/aquaculture and tourism (NASA, 2015a).

Currently, there is no revenue generation or employment opportunities associated with the Primary site or In-Kind sites.

3.13.2 Environmental Consequences

The Proposed Action would result in moderate short-term positive benefits due to job creation and labor income. It is estimated that 200 to 250 construction personnel would be needed during the 6-10-month construction period for the Primary site. A limited work force will be needed for long-term maintenance activities of the proposed PV facilities. All effects to socioeconomics would be beneficial as Primary and In-Kind sites do not currently support jobs or create revenue.

No-Action Alternative

There would be no effects to socioeconomics under the No-Action Alternative. Jobs would neither be created nor lost.

3.14 Environmental Justice

3.14.1 Affected Environment

As described in detail in the NASA-KSC PEIS (NASA, 2016), the population inhabiting Brevard County and Volusia County does not constitute an environmental justice population. The percentage of minorities in both counties is less than 50 percent. Also, the poverty level and median household income levels are lower or comparable to the rest of Florida, and the majority of the population is living well above the poverty level as defined by the U.S. Department of Health and Human Services.

3.14.2 Environmental Consequences

There would be no effects to Environmental Justice caused by implementing the Proposed Action on the Primary site or In-Kind sites as there would be no disproportionate impacts to minority groups, by race or by income at these site locations.

No-Action Alternative

No potential for environmental justice effects would occur under the No Action Alternative, as there is no environmental justice population present in the region.

3.15 Cumulative Impacts

Federal regulations implementing NEPA require an analysis of potential cumulative effects from a proposed action. Cumulative impacts are defined by the CEQ in 40 CFR §1508.7 as impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. The cumulative impact analysis for this EA focuses on the incremental interaction the Proposed Action may have with other past, present, and reasonably foreseeable future actions, and evaluates cumulative impacts potentially resulting from these interactions.

3.15.1 Projects Considered for Potential Cumulative Impacts

The past, present, and reasonably foreseeable future actions at NASA-KSC, CCAFS, and Port Canaveral focus on constructing facilities and improving transportation modes, spacecraft processing and launch, the cruise and cargo industry. Thoughtful planning goes into siting future development activities as NASA-KSC transitions to a multiuser spaceport, including taking into account development suitability/capacity, adjacent land uses, opportunity for infill development, and preservation of environmentally sensitive areas (NASA, 2016).

Future development and activities that may occur in the vicinity of the Primary site or In-Kind sites are described below. Many of these actions involve federal agency agreements or funding and have already had required NEPA documents prepared or would be required to go through NEPA coordination and documentation.

3.15.1.1 Space Launch Facilities

The Ground Systems Deployment and Operations (GSDO) program's primary objective is to prepare NASA-KSC to process and launch the next-generation vehicles and spacecraft designed to achieve NASA's goals for space exploration. Projects being developed under this program are described below.

Space Launch System (SLS) – Launch Complex (LC)-39A pad is being used for processing and launch of Falcon 9 vehicles. It is also being modified to support launch of the Falcon Heavy vehicle in the near future. In 2015 SpaceX constructed a 1.1 acre (0.45 ha) Falcon Integration Hangar at the entrance to LC-39A. Primary components of the hangar include dual overhead bridge cranes, embedded integration rail, and an over-sized door for access of flight hardware and ground support equipment.

SLS rocket and Orion spacecraft – the LC-39B pad is in the process of being redeveloped to allow for launch of multiple types of vehicles. This involves removal of the Fixed Service Structure. This will allow multiple types of vehicles to launch from LC-39B arriving at the pad with service structures on the mobile launch platform rather than custom structures on the pad. NASA has announced LC-39B would be available to commercial users during times when it is not needed by SLS.

LC 39C – NASA-KSC's newest launch pad, is designed to accommodate Small Class Vehicles. Located in the southeast area of the LC-39B perimeter, this new concrete pad measures about 50 ft (15 m) wide by about 100 ft (30 m). Launch Pad 39C will serve as a multi-purpose site allowing companies to test vehicles and capabilities in the smaller class of rockets, making it more affordable for smaller companies to break into the commercial spaceflight market. As part of this capability, NASA's GSDO developed a universal propellant servicing system, which can provide liquid oxygen and liquid methane fueling capabilities for a variety of small class rockets. This system is slated for operational readiness in the summer of 2016. With the addition of Launch Pad 39C, NASA-KSC can offer the following processing and launching features for companies working with small class vehicles:

- Processing facilities – i.e. Vehicle Assembly Building
- Vehicle/payload transportation (KAMAG, flatbed trucks, tugs, etc.) from integration facility to pad
- Launch site

- Universal propellant servicing system (liquid oxygen [LOX], liquid methane)
- Launch control center/mobile command center options

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

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

OneWeb has begun construction of a 100,000 ft^2 (9,290 m^2) satellite spacecraft integration facility at Exploration Park (GSDO 2017, Space Florida 2017). The facility is expected to open in 2018.

Increased flight operations at the SLF would involve construction of new facilities and increased flight operations at the SLF. New construction would occur at both the south- field and mid-field sites.

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

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

Moon Express has negotiated an agreement to use LC-17 and LC-18 from the USAF at CCAFS. Several buildings at LC-17 will be renovated including a former spacecraft integration building and an engineering building. Test stands will be constructed to support work for its spacecraft engines.

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

3.15.1.2 Deepwater Port

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

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

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

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

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

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

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

Construction of two new seaports – one on Banana Creek (a tributary of the Indian River Lagoon) and one on the Banana River just south of the Exploration Park and Industrial Functional Areas would take place in wetlands and waters of the U.S. Occupying 286 additional acres, much or most of which is wetlands. Unless mitigated, this would constitute a permanent, adverse, medium-scale, moderate to major, potentially significant impact on wetlands and waters of the U.S. However, under its Section 404 Clean Water Act permitting authority, the U.S. Army Corps of Engineers would require avoidance or compensatory mitigation for construction (dredging and filling) in wetlands on this scale.

3.15.2 Cumulative Impact Analysis

Implementation of the Proposed Action in conjunction with other past, present, and reasonably foreseeable future actions would cause minor or negligible cumulative impacts. The effects to most resources form the Proposed Action evaluated in this EA are negligible or minor. Short-term effects from construction of the Proposed Action would be limited in duration and unlikely to coincide with many of the other planned projects. As such, compounding effects of typical construction activities (i.e. noise, transportation, visual) would be insignificant.

The Proposed Action is expected to have beneficial long-term effects to air quality, climate change, public health, and socioeconomics. These benefits, albeit minor or negligible, would help to offset adverse effects from other projects.

Long-term effects of the Proposed Action on biological and coastal resources has the most potential to cause cumulative impacts, when considered with other past, present, and reasonably foreseeable future actions. Impacts to wetlands and surface waters for the Proposed Action and other projects would be permitted by FDEP and USACE, and compensatory mitigation to offset adverse effects would be provided. Similarly, impacts to state or federally protected species or their habitats would be reviewed in consultation with the FFWC, USFWS, NASA-KSC, and MINWR to determine avoidance and minimization practices and mitigation measures needed to offset functional losses associated with unavoidable impacts. Given the compensatory mitigation that would be provided to offset functional losses of biological and coastal resources, the overall cumulative impact to these resources would be minor.

4.0 MITIGATION AND MONITORING

The following section describes proposed mitigation and monitoring efforts included in the Proposed Action.

4.1 Biological Resources

Impacts to vegetation communities would be minimized by limiting the footprint of the solar facilities to the minimum area needed. Best Management Practices (BMPs) would be implemented during construction to minimize impacts to surrounding vegetation communities.

Impacts to wetlands would be minimized to the maximum extent practicable. State and federal permits authorizing unavoidable impacts would be obtained prior to start of construction. Mitigation would be provided to compensate for the functions lost as a result of the Proposed Action. Mitigation is likely to consist of purchasing approved state and federal wetland mitigation credits in the same watershed basin as the Proposed Action. Other mitigation options could include monetary compensation for wetland loss or wetland restoration.

Mitigation would be provided for loss of scrub-jay protected habitat. The type and amount of mitigation needed to compensate for the loss due to the Proposed Action would be determined through consultation with the USFWS and MINWR.

4.2 Cultural Resources

No adverse effects are expected to occur from the Proposed Action. However, should unanticipated cultural resources be discovered during construction then work will stop until a plan to investigate and evaluate the resources for significance has been approved and implemented to the degree required.

4.3 Hazardous Materials/Hazardous Waste

A site-specific SPCC Plan will be developed and adhered to during construction and operation of the Proposed Action. Clean up and disposal of wastes will be performed in compliance with the plan and state and federal regulations. Appropriate reporting requirements will be adhered to.

4.4 Water Resources

BMPs to control erosion, sedimentation, and stormwater surface runoff would be implemented throughout construction to minimize adverse impacts on water resources. Also, water quality monitoring and reporting would be performed throughout the construction process per requirements of the Construction Stormwater NPDES permit. Repair or maintenance of BMPs would be performed as needed to ensure the devices are functioning as required to meet permit conditions.

4.5 Soils

BMPs would be implemented during all construction activities involving ground surface disturbance to minimize soil erosion.

4.6 Health and Safety

Construction workers would adhere to a project-specific health and safety plan that will include a requirement to identify potential hazards and means for avoiding these hazards to the extent possible.

5.0 CONSULTATION AND COORDINATION

NEPA regulations require that federal, state, and local agencies with jurisdiction or special expertise regarding environmental impacts be consulted and involved in the NEPA process. The individuals and agencies listed in Table 5-1 were contacted during the preparation of this EA.

Table 5-1. Consultation and Coordination List – To be completed by NASA (advise if TRC should conduct this communication)

Affiliation	Point of Contact	Mailing Address and Phone Number
USFWS MINWR		P.O. Box 6504 Titusville, FL 32782 (321) 861-0667
USACE	Tamy Dabu, Project Manager	400 High Point Drive, Suite 600 Cocoa, FL 32926 (321) 504-3771
FDEP	Sally Mann, Director of the Office of Intergovernmental Programs	Marjory Stoneman Douglas Building 3900 Commonwealth Boulevard Tallahassee, FL 32399-3000
	Aaron T. Watkins, Environmental Specialist	3319 Maguire Boulevard, Suite 232 Orlando, FL 32803-3767 (407) 894-7555
FSHPO	Frederick Gaske, Director	500 S. Bronough Street Tallahassee, FL 32399-0250 (850) 245-6333
FFWCC	Ken Haddad, Executive Director	620 South Meridian Street Tallahassee, FL 32399-1600 (850) 487-3796
	Dennis David, Regional Director	1239 S.W. 10th Street Ocala, FL 34471-0323 (352) 732-1225
Florida Research Center for Agricultural Sustainability	Robert C. Adair, Jr., Executive Director	7055 33rd Street Vero Beach, FL 32966 (772) 562-3802
SJRWMD	Susan R. Moor, Supervising Regulatory Scientist	525 Community College Parkway S.E. Palm Bay, FL 32909 (321) 676-6626
Brevard County	Peggy Busacca, County Manager	2725 Judge Fran Jamieson Way, Bldg. C Viera, Fl 32940 (321) 633-2010
	Ernie Brown, Director, Natural Resources Management	2725 Judge Fran Jamieson Way Viera, FL 32940 (321) 633-2016
	Robin Sobrino, AICP, Director of Planning & Zoning Office	2725 Judge Fran Jamieson Way Viera, FL 32940 (321)633-2070
City of Titusville, Florida	Mark K. Ryan, City Manager	P.O. Box 2806 Titusville, FL 32796 City of Titusville, Florida (321) 383-5802
	Courtney Harris, AICP, Executive Director of the Planning & Growth Management	P.O. Box 2806 Titusville, FL 32796 (321) 383-5824

6.0 LIST OF PREPARERS

The FPL liaison associated with the preparation of this EA is:

Danielle Hall, Jackie Kingston
700 Universe Blvd.
Juno Beach, FL 33408

The NASA-KSC liaison associated with the preparation of this EA is:

Donald Dankert,
Environmental Management Branch, SI-E3,
Kennedy Space Center, FL 328992016

The contractor responsible for preparing this EA is:

TRC Environmental Corporation (TRC)
Jacksonville, FL

The following individuals contributed to the preparation of this document:

Name	Role	Years of Experience	Responsibilities
Lisa Walker TRC, Jacksonville, Florida	Project Manager Biologist	21	Project Management Affected Environment Environmental Consequences
Jennifer Smith TRC, Palm Beach Gardens, Florida	Biologist	15	Regulatory Requirements Affected Environment
Patrick J. Fennell, P.E. TRC, Windsor, Connecticut	Environmental Engineer	24	Air Quality
Rebecca Spring TRC, Norcross, Georgia	GIS Specialist	7	Maps/Figures Coordinator
Andrew Lydick TRC, Norcross, Georgia	Principal	35	Quality Assurance Review
Keith Suderman TRC, Norcross, GA	NEPA Specialist	24	Quality Assurance Review

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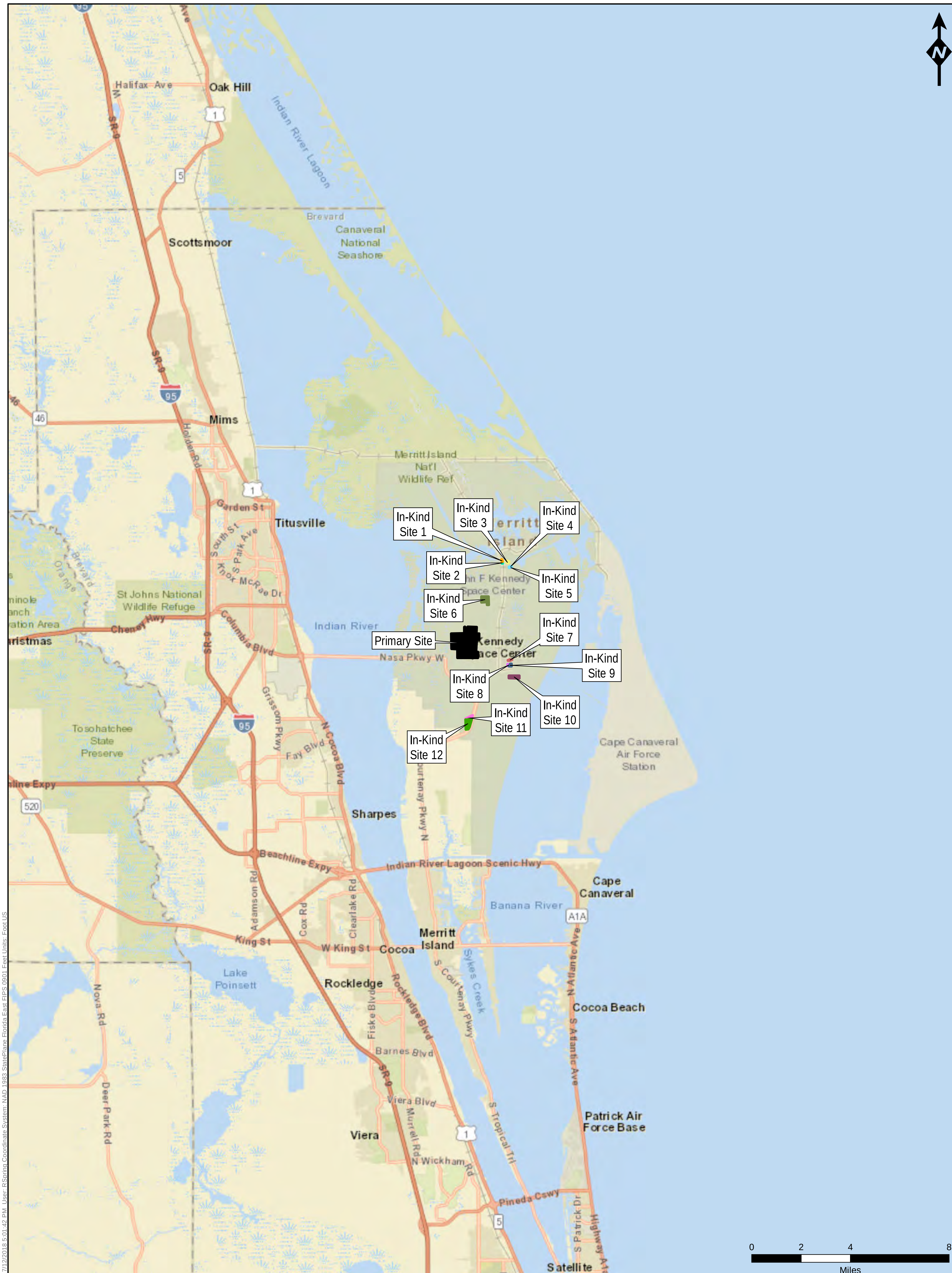
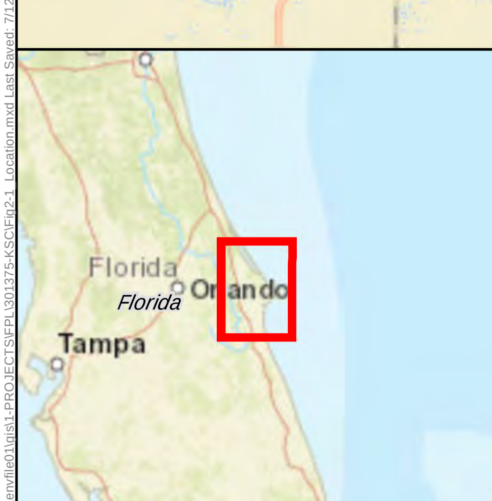
Figures





Primary Site	In-Kind Site 7
In-Kind Site 1	In-Kind Site 8
In-Kind Site 2	In-Kind Site 9
In-Kind Site 3	In-Kind Site 10
In-Kind Site 4	In-Kind Site 11
In-Kind Site 5	In-Kind Site 12
In-Kind Site 6	

Notes:
Basemap acquired from Esri "World Street Map" online service layer, accessed May 2018.

Project Site Boundary developed from Parcel boundaries provided in KMZ format by FPL, April 2018. KMZ file was converted by TRC for GIS functionality.

Scale: 1:240,000
(Sheet @11"x17")
1 inch = 3.79 miles
1 inch = 20,000 feet

FIGURE 2-1

FLORIDA POWER & LIGHT
KENNEDY SPACE CENTER
SITE LOCATION
BREVARD COUNTY, FLORIDA

CREATED: 7/12/2018

TRC Results you can rely on
4155 SHACKLEFORD RD
SUITE 225
NORCROSS, GA 30093

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Site Location Boundary

Notes:
Basemap acquired from Esri "World Imagery (Clarity)" online service layer, accessed July 2018.

Project Site Boundary developed from Parcel boundaries provided in KMZ format by FPL, April 2018. KMZ file was converted by TRC for GIS functionality.

Scale: 1:9,600
(Sheet @11"x17")
1 inch = 0.15 miles
1 inch = 800 feet

FPL

FIGURE 2-2
(Sheet 1 of 5)
FLORIDA POWER & LIGHT
KENNEDY SPACE CENTER
AERIAL
BREVARD COUNTY, FLORIDA

CREATED: 7/17/2018

TRC Results you can rely on

4155 SHACKLEFORD RD
SUITE 225
NORCROSS, GA 30093

Site Location Boundary

Notes:
Basemap acquired from Esri "World Imagery (Clarity)" online service layer, accessed July 2018.

Project Site Boundary developed from Parcel boundaries provided in KMZ format by FPL, April 2018. KMZ file was converted by TRC for GIS functionality.

Scale: 1:4,800
(Sheet @11"x17")
1 inch = 0.08 miles
1 inch = 400 feet

FIGURE 2-2A
(Sheet 2 of 5)
FLORIDA POWER & LIGHT
KENNEDY SPACE CENTER
AERIAL
BREVARD COUNTY, FLORIDA

CREATED:
7/17/2018

TRC Results you can rely on
4155 SHACKLEFORD RD
SUITE 225
NORCROSS, GA 30093

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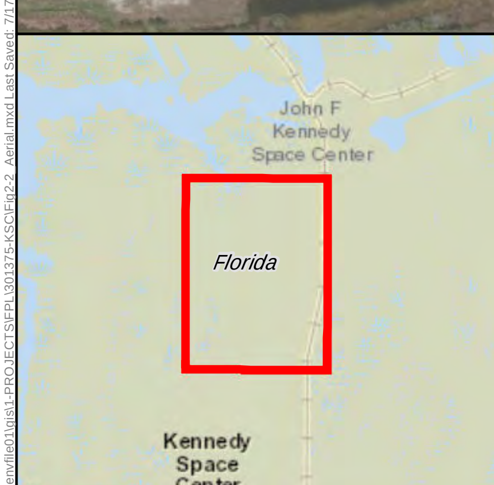

Site Location Boundary

Notes:
Basemap acquired from Esri "World Imagery (Clarity)" online service layer, accessed July 2018.

Project Site Boundary developed from Parcel boundaries provided in KMZ format by FPL, April 2018. KMZ file was converted by TRC for GIS functionality.

Scale: 1:4,800
(Sheet @11"x17")
1 inch = 0.08 miles
1 inch = 400 feet

FIGURE 2-2B
(Sheet 3 of 5)
FLORIDA POWER & LIGHT
KENNEDY SPACE CENTER
AERIAL
BREVARD COUNTY, FLORIDA

CREATED:
7/17/2018

TRC Results you can rely on
4155 SHACKLEFORD RD
SUITE 225
NORCROSS, GA 30093

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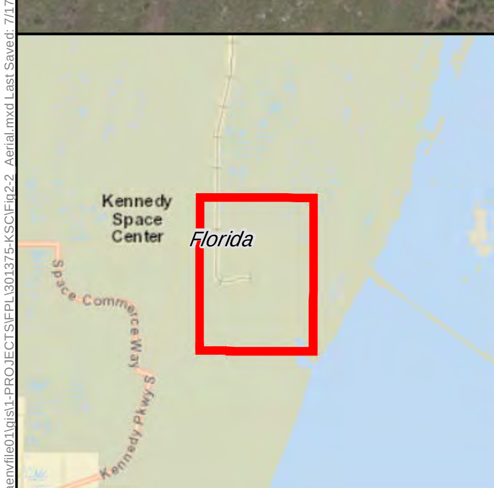

Site Location Boundary

Notes:
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Project Site Boundary developed from Parcel boundaries provided in KMZ format by FPL, April 2018. KMZ file was converted by TRC for GIS functionality.

Scale: 1:6,000
(Sheet @11"x17")
1 inch = 0.09 miles
1 inch = 500 feet

FIGURE 2-2C
(Sheet 4 of 5)
FLORIDA POWER & LIGHT
KENNEDY SPACE CENTER
AERIAL
BREVARD COUNTY, FLORIDA

CREATED:
7/17/2018

TRC
Results you can rely on

4155 SHACKLEFORD RD
SUITE 225
NORCROSS, GA 30093

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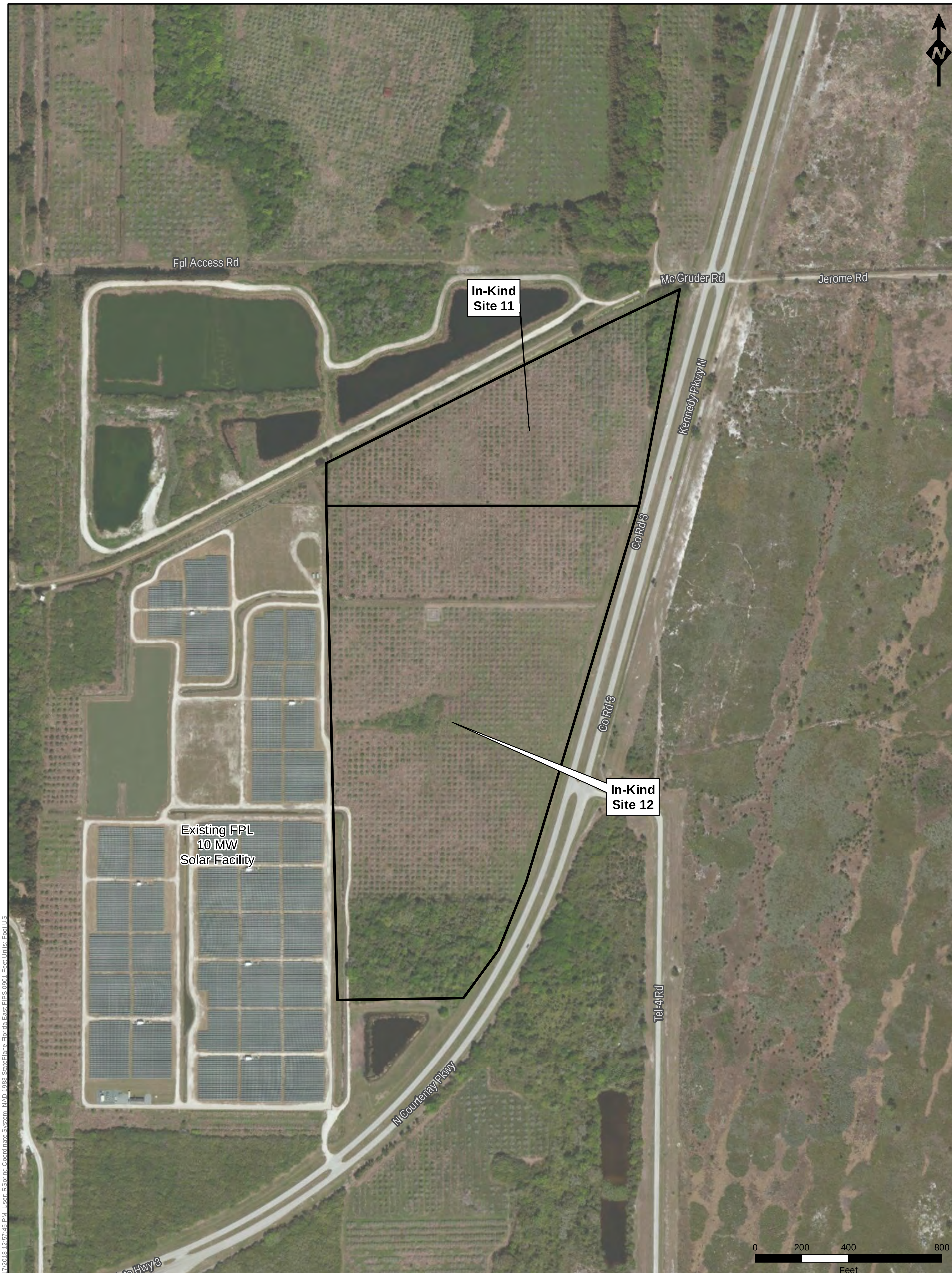
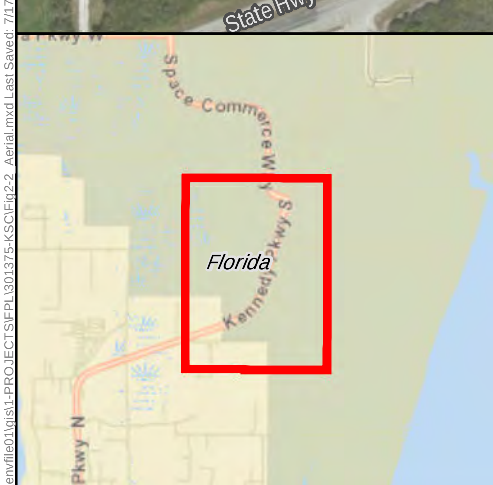




Site Location Boundary

Notes:
Basemap acquired from Esri "World Imagery (Clarity)" online service layer, accessed July 2018.

Project Site Boundary developed from Parcel boundaries provided in KMZ format by FPL, April 2018. KMZ file was converted by TRC for GIS functionality.

Scale: 1:4,800
(Sheet @11"x17")
1 inch = 0.08 miles
1 inch = 400 feet

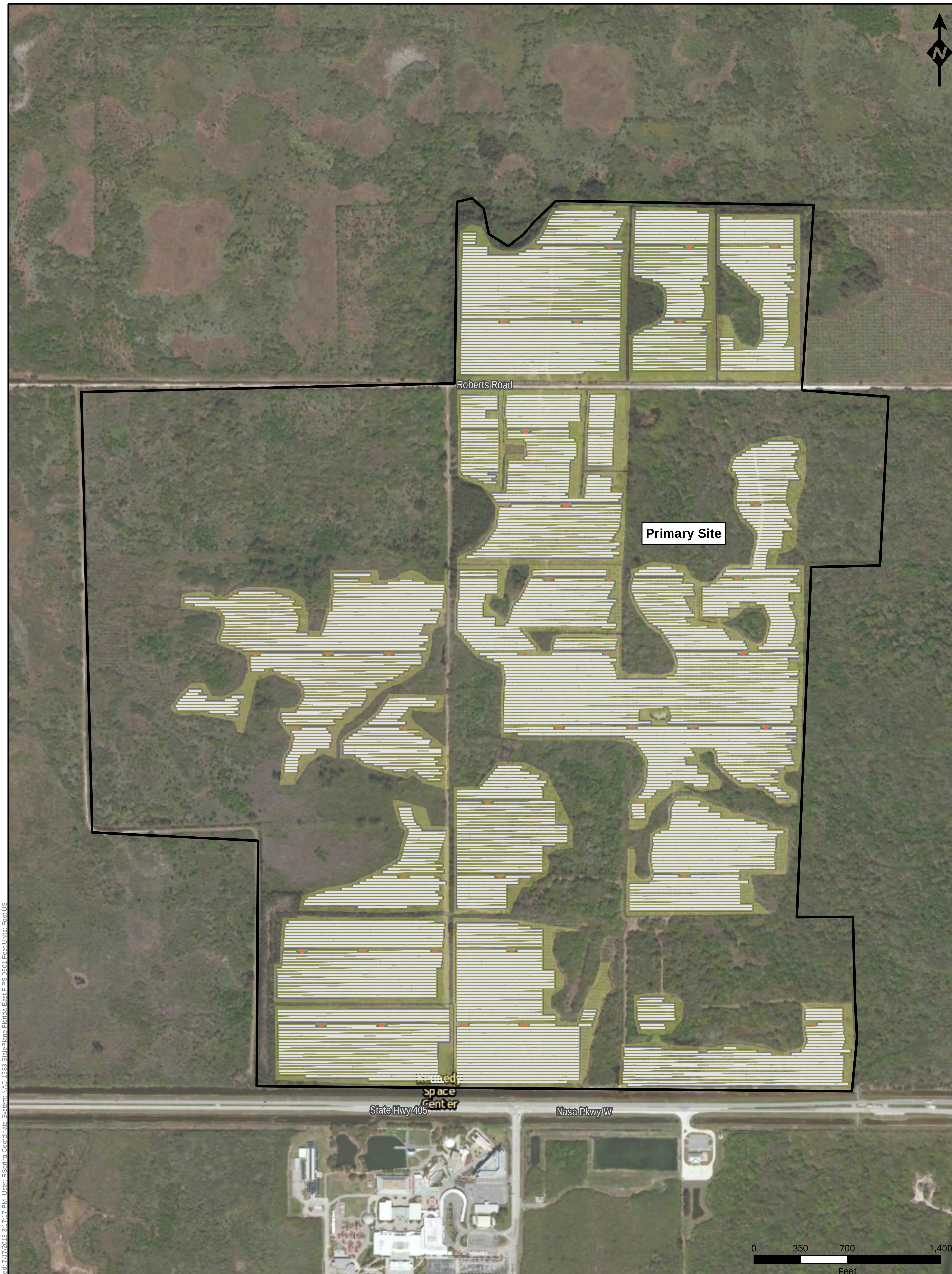
FPL

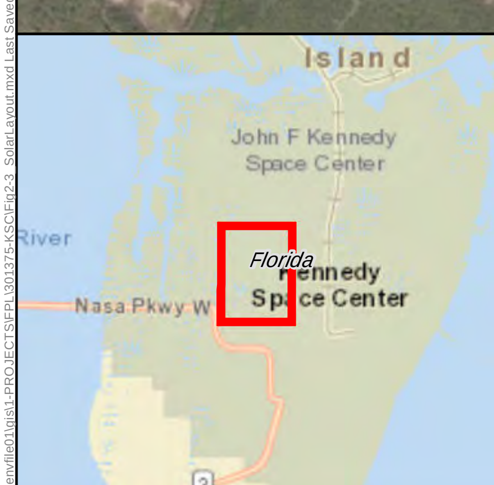
FIGURE 2-2D
(Sheet 5 of 5)
FLORIDA POWER & LIGHT
KENNEDY SPACE CENTER
AERIAL
BREVARD COUNTY, FLORIDA

CREATED:
7/17/2018

TRC Results you can rely on

4155 SHACKLEFORD RD
SUITE 225
NORCROSS, GA 30093





Site Location Boundary
Inverter
Solar Array Table
Area of Impact Calculations

Notes:
Basemap acquired from Esri "World Imagery (Clarity)" online service layer, accessed July 2018.

Project Site Boundary developed from Parcel boundaries provided in KMZ format by FPL, April 2018. Inverter and Arrays from "Kennedy_2020_167_Layout" KMZ file provided by FPL, July 2018. KMZ files were converted by TRC for GIS functionality.

Scale: 1:8,400
(Sheet @11"x17")
1 inch = 0.13 miles
1 inch = 700 feet

FIGURE 2-3

FLORIDA POWER & LIGHT
KENNEDY SPACE CENTER
PROPOSED SOLAR FACILITY
LAYOUT ON PRIMARY SITE
BREVARD COUNTY, FLORIDA

CREATED:
7/17/2018

4155 SHACKLEFORD RD
SUITE 225
NORCROSS, GA 30093

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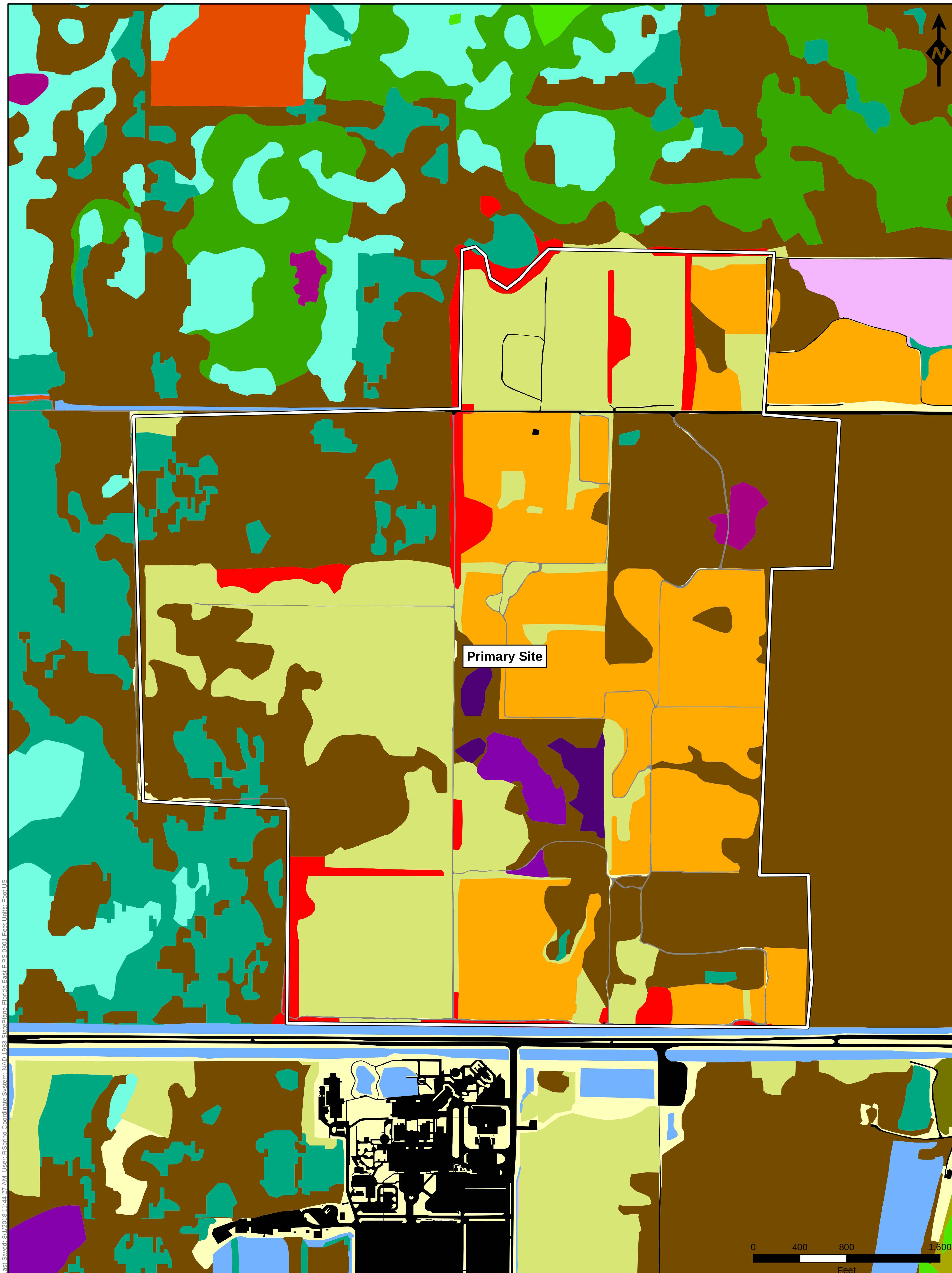

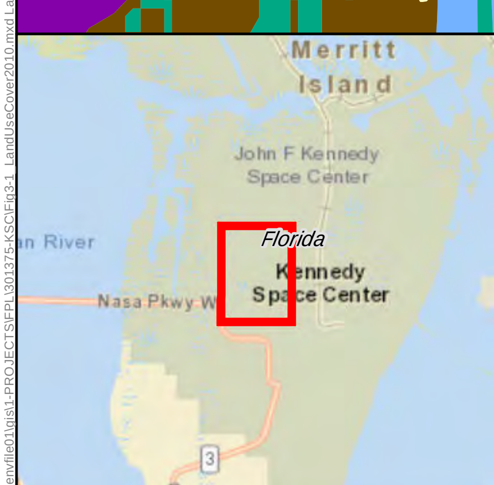

Site Location Boundary

Land Cover 2010:

- infrastructure - primary
- infrastructure - secondary
- water - interior - fresh
- marsh - freshwater
- wetland scrub-shrub - freshwater
- wetland coniferous / hardwood forest
- wetland hardwood forest
- ruderal - herbaceous
- ruderal - woody
- citrus
- citrus to Brazilian pepper
- Brazilian pepper
- Australian pine
- palmetto scrub
- pine flatwoods
- upland coniferous / hardwood forest
- upland hardwood forest
- cabbage palm
- hardwood hammock
- Undefined land cover

Notes:

Project Site Boundary developed from Parcel boundaries provided in KMZ format by FPL, April 2018. KMZ file was converted by TRC for GIS functionality.

Land Cover 2010 data provided by FPL, July 2018.

Scale: 1:9,600
(Sheet @11"x17")
1 inch = 0.15 miles
1 inch = 800 feet

FPL

FIGURE 3-1
(Sheet 1 of 5)
FLORIDA POWER & LIGHT
KENNEDY SPACE CENTER
LAND COVER (2010)
BREVARD COUNTY, FLORIDA

CREATED:
8/1/2018

TRC
Results you can rely on

4155 SHACKLEFORD RD
SUITE 225
NORCROSS, GA 30093

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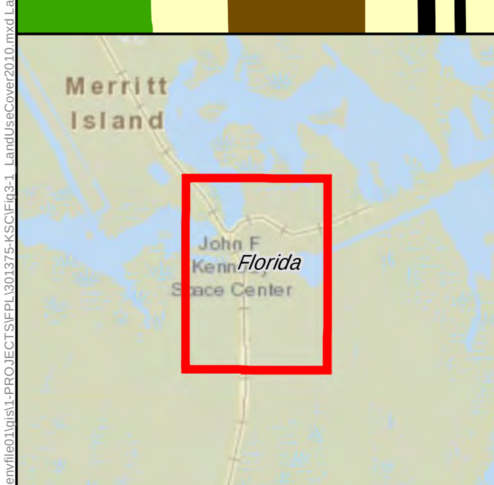

Site Location Boundary

Land Cover 2010:

- infrastructure - primary
- infrastructure - secondary
- estuary
- water - interior - salt
- water - interior - fresh
- marsh - saltwater
- marsh - freshwater
- mangrove
- wetland scrub-shrub - saltwater
- wetland scrub-shrub - freshwater
- ruderal - herbaceous
- ruderal - woody
- Brazilian pepper
- oak scrub
- palmetto scrub
- pine flatwoods
- upland coniferous / hardwood forest
- hardwood hammock
- Undefined land cover

Notes:

Project Site Boundary developed from Parcel boundaries provided in KMZ format by FPL, April 2018. KMZ file was converted by TRC for GIS functionality.

Land Cover 2010 data provided by FPL, July 2018.

Scale: 1:4,800
(Sheet @11"x17")
1 inch = 0.08 miles
1 inch = 400 feet

FIGURE 3-1A
(Sheet 2 of 5)
FLORIDA POWER & LIGHT
KENNEDY SPACE CENTER
LAND COVER (2010)
BREVARD COUNTY, FLORIDA

CREATED:
8/1/2018

TRC Results you can rely on
4155 SHACKLEFORD RD
SUITE 225
NORCROSS, GA 30093

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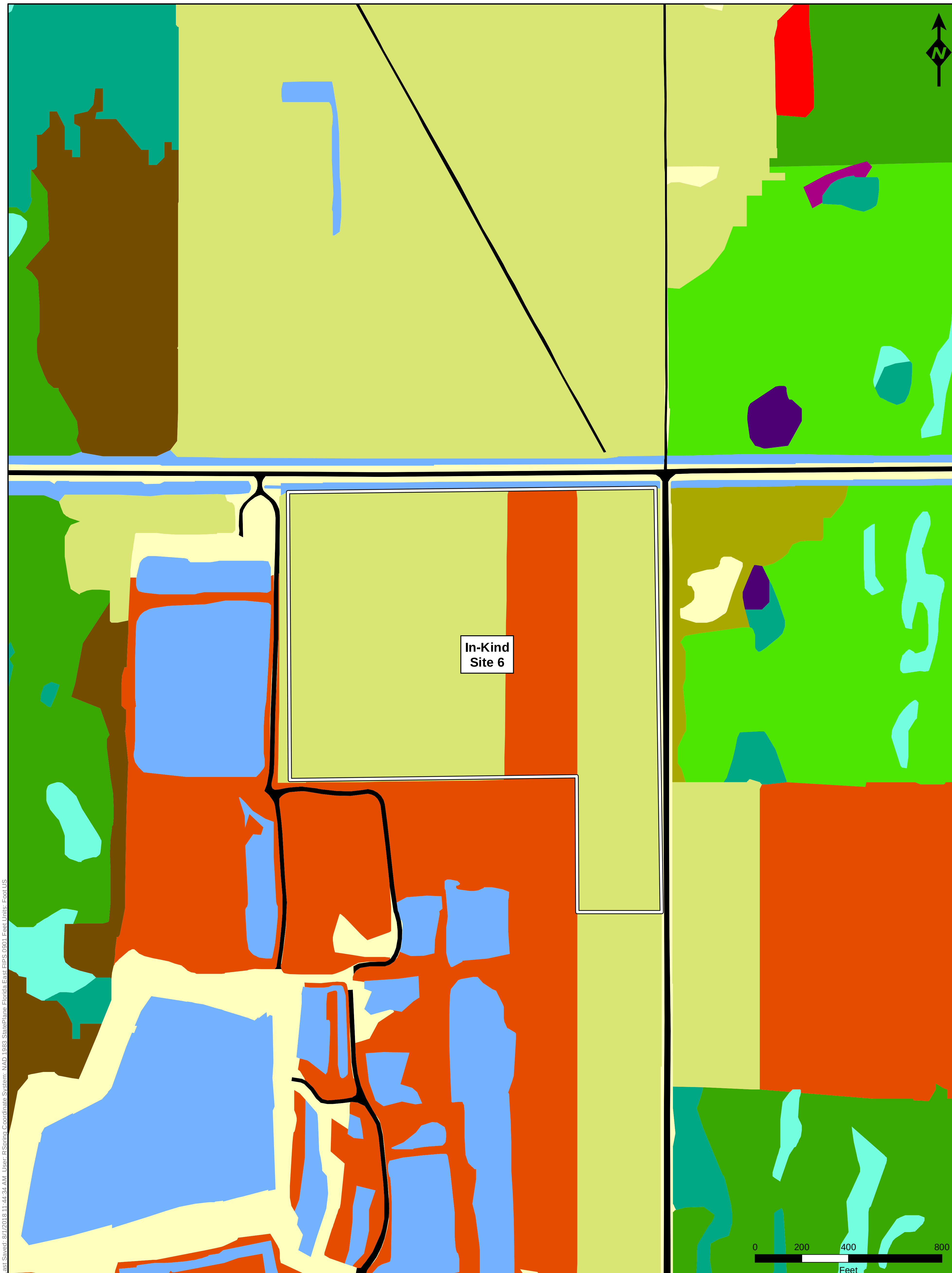

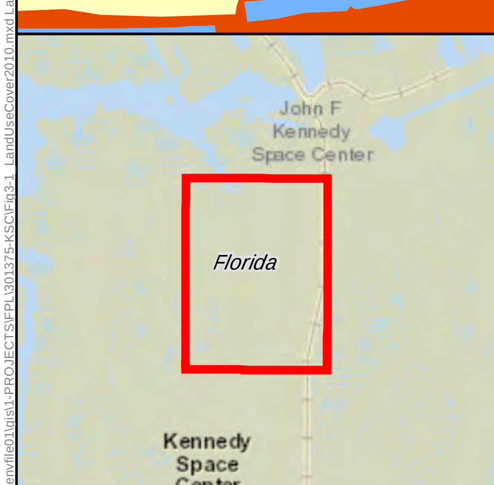

Site Location Boundary

Land Cover 2010:

- infrastructure - primary
- water - interior - fresh
- marsh - freshwater
- wetland scrub-shrub - freshwater
- wetland hardwood forest
- ruderal - herbaceous
- ruderal - woody
- Brazilian pepper
- Australian pine
- palmetto scrub
- pine flatwoods
- upland coniferous / hardwood forest
- cabbage palm
- hardwood hammock
- Undefined land cover

Notes:
Project Site Boundary developed from Parcel boundaries provided in KMZ format by FPL, April 2018. KMZ file was converted by TRC for GIS functionality.

Land Cover 2010 data provided by FPL, July 2018.

Scale: 1:4,800
(Sheet @11"x17")
1 inch = 0.08 miles
1 inch = 400 feet

FIGURE 3-1B
(Sheet 3 of 5)
FLORIDA POWER & LIGHT
KENNEDY SPACE CENTER
LAND COVER (2010)
BREVARD COUNTY, FLORIDA

CREATED:
8/1/2018

4155 SHACKLEFORD RD
SUITE 225
NORCROSS, GA 30093

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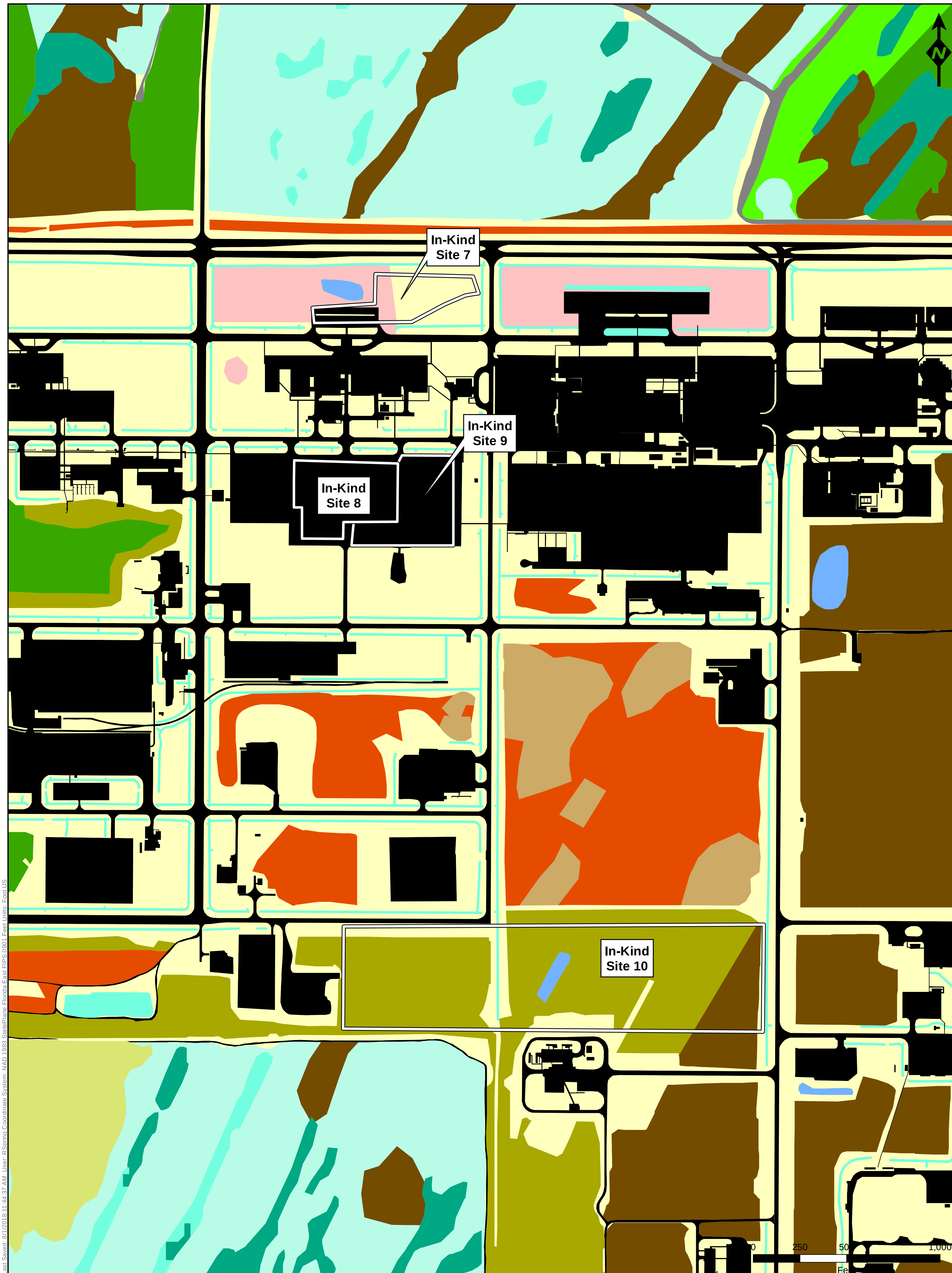

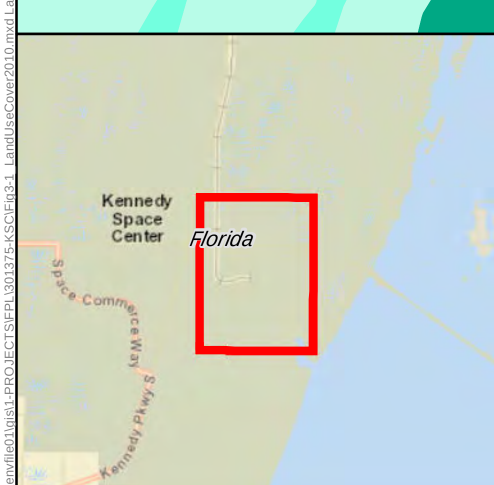

Site Location Boundary

Land Cover 2010:

- infrastructure - primary
- infrastructure - secondary
- water - interior - fresh
- marsh - freshwater
- wetland scrub-shrub - freshwater
- ruderal - herbaceous
- ruderal - herbaceous with trees
- ruderal - woody
- Brazilian pepper
- oak scrub
- scrubby flatwoods
- pine flatwoods
- upland coniferous forest
- upland coniferous / hardwood forest
- hardwood hammock
- Undefined land cover

Notes:

Project Site Boundary developed from Parcel boundaries provided in KMZ format by FPL, April 2018. KMZ file was converted by TRC for GIS functionality.

Land Cover 2010 data provided by FPL, July 2018.

Scale: 1:6,000
(Sheet @11"x17")
1 inch = 0.09 miles
1 inch = 500 feet

FPL

FIGURE 3-1C
(Sheet 4 of 5)
FLORIDA POWER & LIGHT
KENNEDY SPACE CENTER
LAND COVER (2010)
BREVARD COUNTY, FLORIDA

CREATED: 8/1/2018

TRC *Results you can rely on*

4155 SHACKLEFORD RD
SUITE 225
NORCROSS, GA 30093

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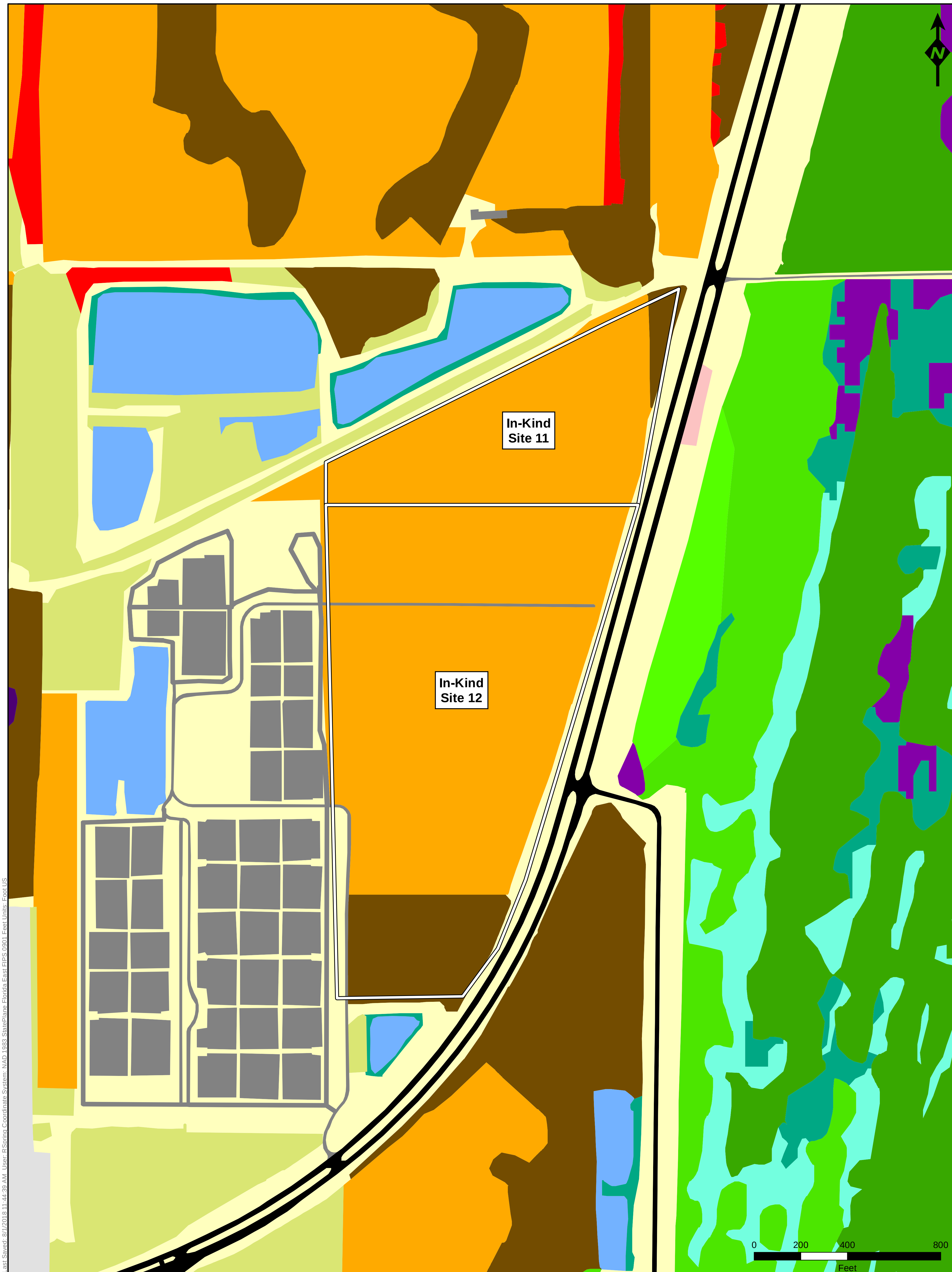
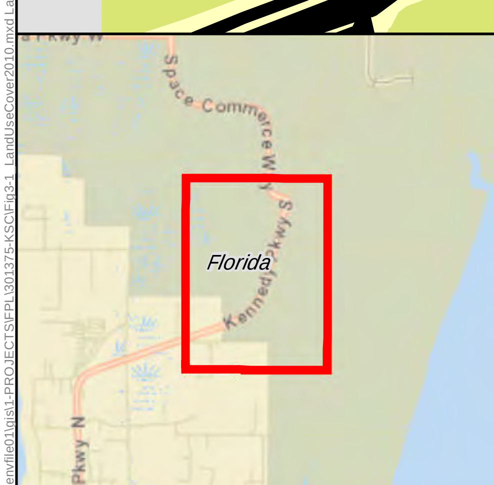




Site Location Boundary

Land Cover 2010:

- infrastructure - primary
- infrastructure - secondary
- water - interior - fresh
- marsh - freshwater
- wetland scrub-shrub - freshwater
- wetland coniferous / hardwood forest
- wetland hardwood forest
- ruderal - herbaceous
- ruderal - herbaceous with trees
- citrus
- Brazilian pepper
- Australian pine
- oak scrub
- palmetto scrub
- pine flatwoods
- hardwood hammock
- Undefined land cover

Notes:
Project Site Boundary developed from Parcel boundaries provided in KMZ format by FPL, April 2018. KMZ file was converted by TRC for GIS functionality.

Land Cover 2010 data provided by FPL, July 2018.

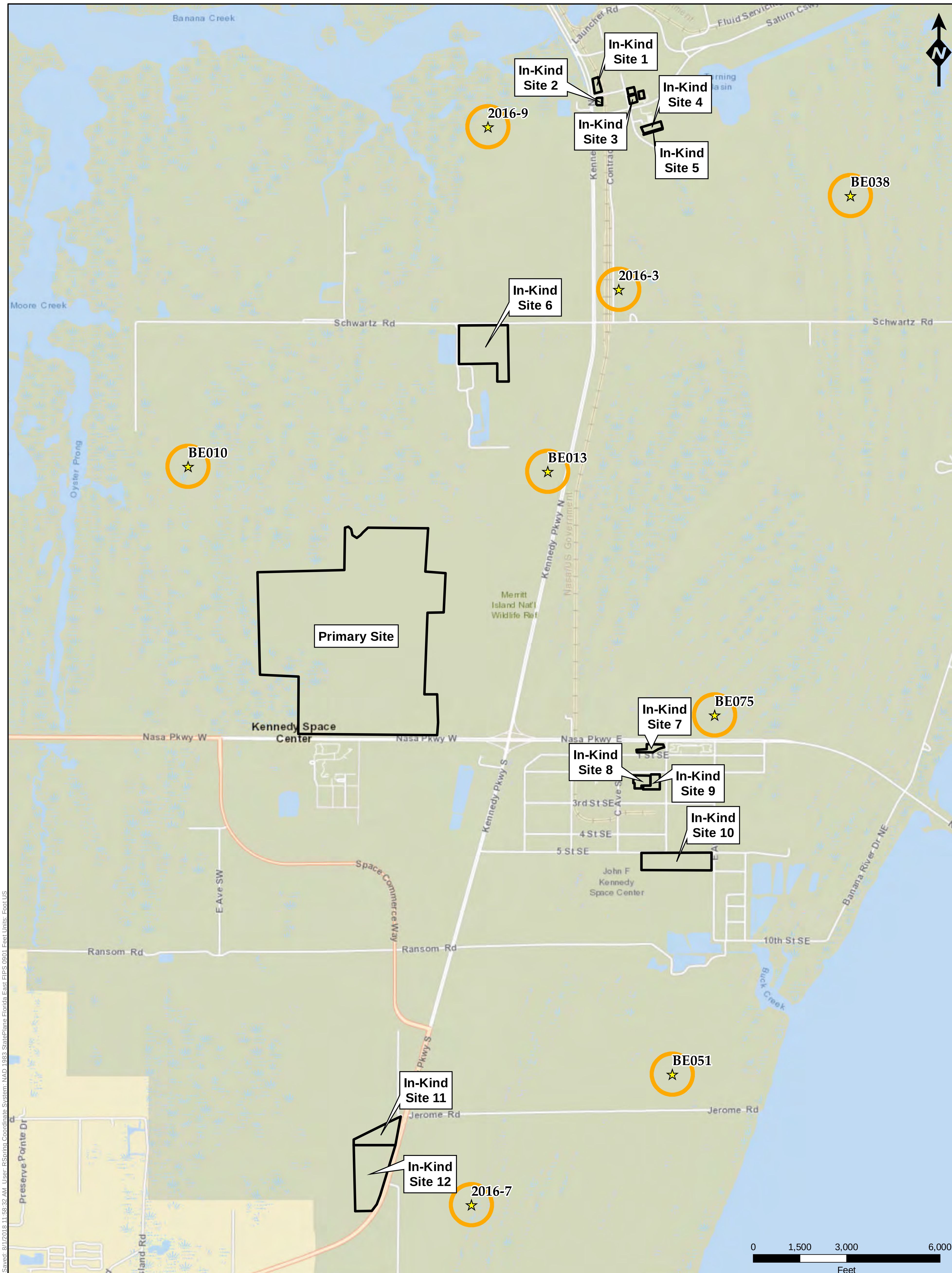
Scale: 1:4,800
(Sheet @11"x17")
1 inch = 0.08 miles
1 inch = 400 feet

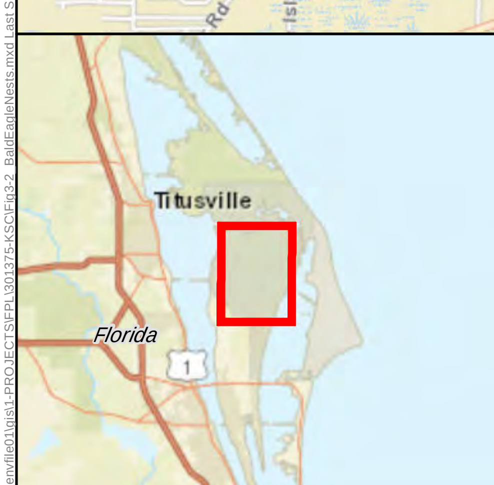
FIGURE 3-1D
(Sheet 5 of 5)
FLORIDA POWER & LIGHT
KENNEDY SPACE CENTER
LAND COVER (2010)
BREVARD COUNTY, FLORIDA

CREATED: 8/1/2018

4155 SHACKLEFORD RD
SUITE 225
NORCROSS, GA 30093

\\apaenvfile01\gis1-PROJECTS\FPL\301375-KSC\Fig3-1_LandUseCover2010.mxd Last Saved: 8/1/2018 11:44:39 AM User: RSpring Coordinate System: NAD 1983 StatePlane Florida East FIPS 0901 Feet Units: Foot US





★ Bald Eagle Nest Location

660-foot Protection Buffer

Site Location Boundary

Notes:

Basemap acquired from Esri "World Light Gray Canvas Base" online service layer, accessed May 2018.

Project Site Boundary developed from Parcel boundaries provided in KMZ format by FPL, April 2018. KMZ file was converted by TRC for GIS functionality.

Eagle Nest and Florida Scrub Jay (FSJ) locations provided by FPL April and July 2018.

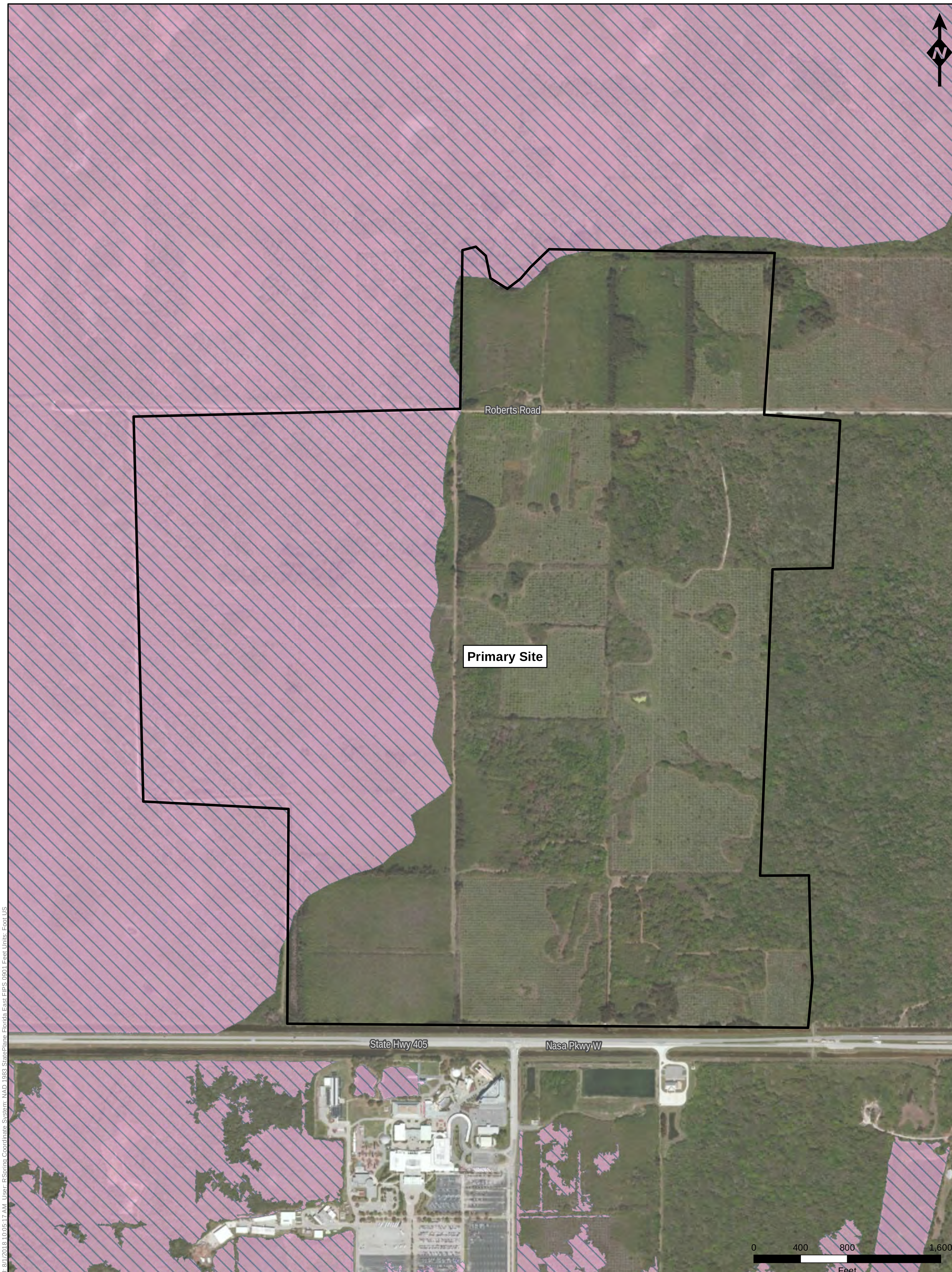
Scale: 1:36,000
(Sheet @11"x17")
1 inch = 3,000 feet

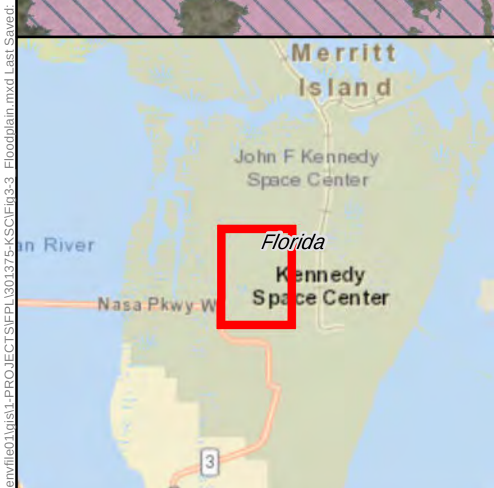
FIGURE 3.2

FLORIDA POWER & LIGHT
KENNEDY SPACE CENTER
BALD EAGLE NEST LOCATIONS
BREVARD COUNTY, FLORIDA

CREATED:
8/1/2018

4155 SHACKLEFORD RD
SUITE 225
NORCROSS, GA 30093





Site Location Boundary

100-Year Floodplain (Zone AE)

Notes:

Basemap acquired from Esri "World Imagery (Clarity)" online service layer, accessed May 2018.

Project Site Boundary developed from Parcel boundaries provided in KMZ format by FPL, April 2018. KMZ file was converted by TRC for GIS functionality.

Floodplain data acquired from Federal Emergency Management Agency (FEMA) National Flood Hazard Layer (NFHL), published date 2018-01-19.

Scale: 1:9,600
(Sheet @11"x17")
1 inch = 0.15 miles
1 inch = 800 feet

FPL

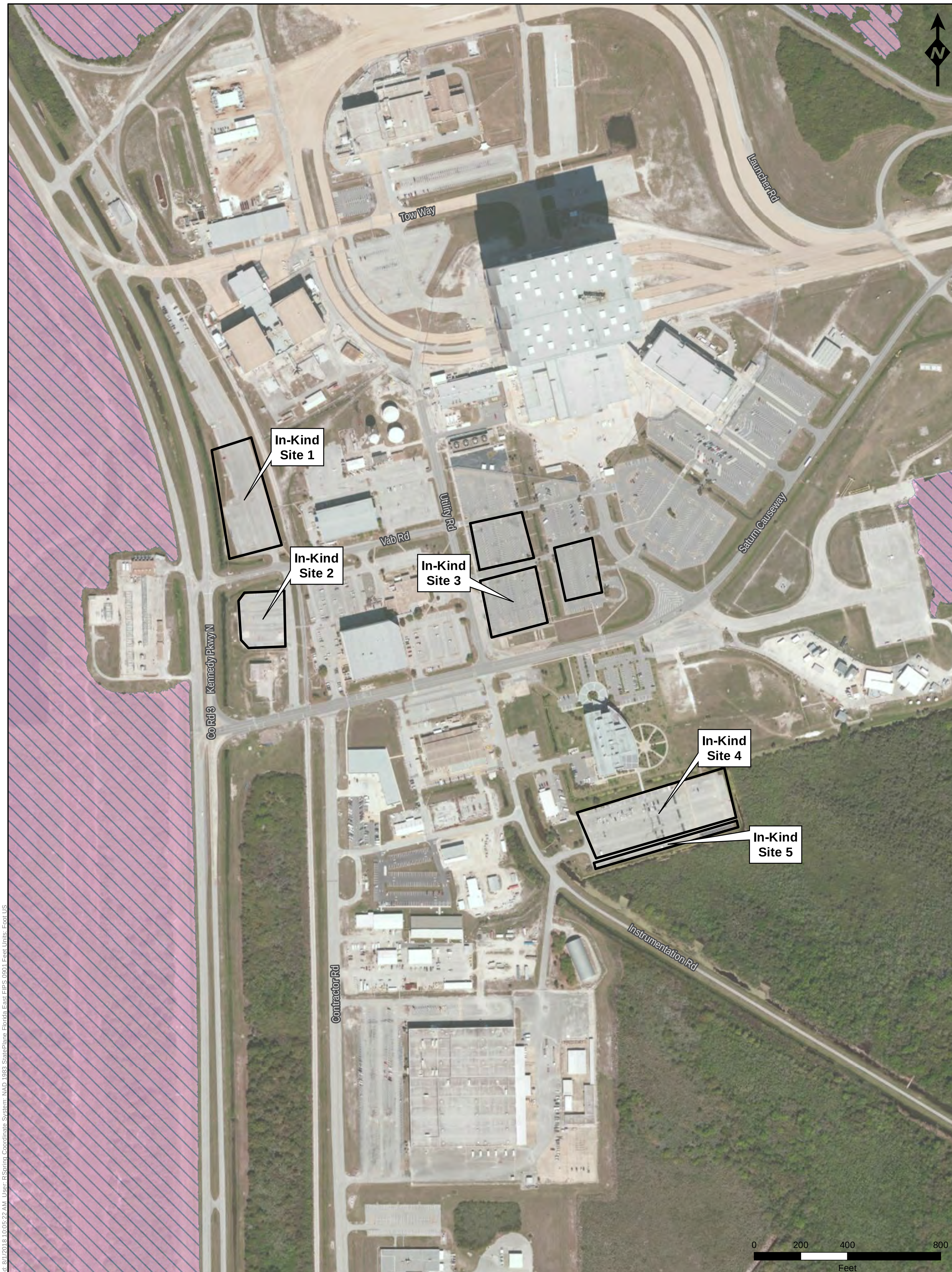
FIGURE 3-3
(Sheet 1 of 5)
FLORIDA POWER & LIGHT
KENNEDY SPACE CENTER
FLOODPLAINS
BREVARD COUNTY, FLORIDA

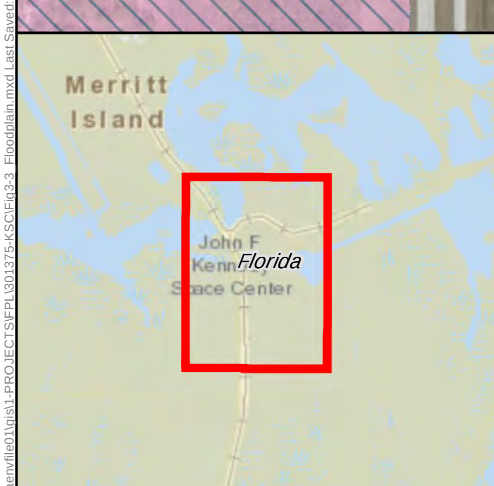
CREATED:
8/1/2018

TRC
Results you can rely on

4155 SHACKLEFORD RD
SUITE 225
NORCROSS, GA 30093

\\apaenvfile01\gis\1-PROJECTS\FPL\301375-KSC\Fig3-3_Floodplain.mxd Last Saved: 8/1/2018 10:05:17 AM User: RSpring Coordinate System: NAD 1983 StatePlane Florida East FIPS 0901 Feet Units: Foot US





Site Location Boundary

100-Year Floodplain (Zone AE)

Notes:

Basemap acquired from Esri "World Imagery (Clarity)" online service layer, accessed May 2018.

Project Site Boundary developed from Parcel boundaries provided in KMZ format by FPL, April 2018. KMZ file was converted by TRC for GIS functionality.

Floodplain data acquired from Federal Emergency Management Agency (FEMA) National Flood Hazard Layer (NFHL), published date 2018-01-19.

Scale: 1:4,800
(Sheet @11"x17")
1 inch = 0.08 miles
1 inch = 400 feet

FIGURE 3-3A
(Sheet 2 of 5)
FLORIDA POWER & LIGHT
KENNEDY SPACE CENTER
FLOODPLAINS
BREVARD COUNTY, FLORIDA

CREATED:
8/1/2018

4155 SHACKLEFORD RD
SUITE 225
NORCROSS, GA 30093

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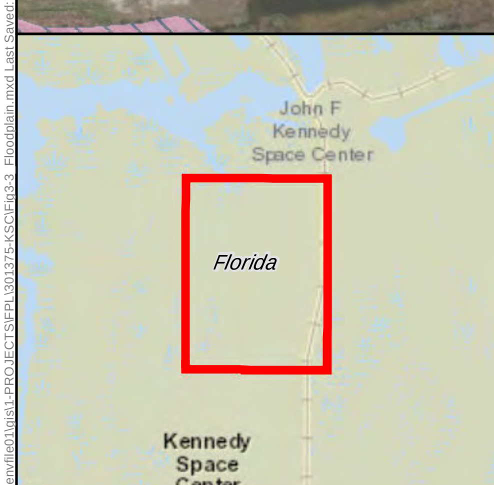

Site Location Boundary

100-Year Floodplain (Zone AE)

Notes:

Basemap acquired from Esri "World Imagery (Clarity)" online service layer, accessed May 2018.

Project Site Boundary developed from Parcel boundaries provided in KMZ format by FPL, April 2018. KMZ file was converted by TRC for GIS functionality.

Floodplain data acquired from Federal Emergency Management Agency (FEMA) National Flood Hazard Layer (NFHL), published date 2018-01-19.

Scale: 1:4,800
(Sheet @11"x17")
1 inch = 0.08 miles
1 inch = 400 feet

FIGURE 3-3B
(Sheet 3 of 5)
FLORIDA POWER & LIGHT
KENNEDY SPACE CENTER
FLOODPLAINS
BREVARD COUNTY, FLORIDA

CREATED:
8/1/2018

4155 SHACKLEFORD RD
SUITE 225
NORCROSS, GA 30093

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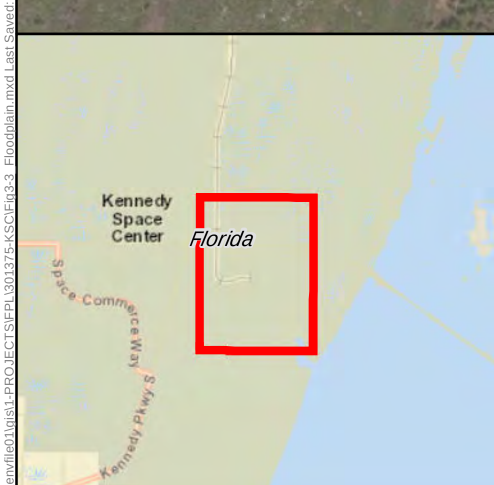

Site Location Boundary

Notes:
Basemap acquired from Esri "World Imagery (Clarity)" online service layer, accessed May 2018.

Project Site Boundary developed from Parcel boundaries provided in KMZ format by FPL, April 2018. KMZ file was converted by TRC for GIS functionality.

Floodplain data acquired from Federal Emergency Management Agency (FEMA) National Flood Hazard Layer (NFHL), published date 2018-01-19.

Scale: 1:6,000
(Sheet @11"x17")
1 inch = 0.09 miles
1 inch = 500 feet

FIGURE 3-3C
(Sheet 4 of 5)
FLORIDA POWER & LIGHT
KENNEDY SPACE CENTER
FLOODPLAINS
BREVARD COUNTY, FLORIDA

CREATED:
8/1/2018

TRC Results you can rely on

4155 SHACKLEFORD RD
SUITE 225
NORCROSS, GA 30093

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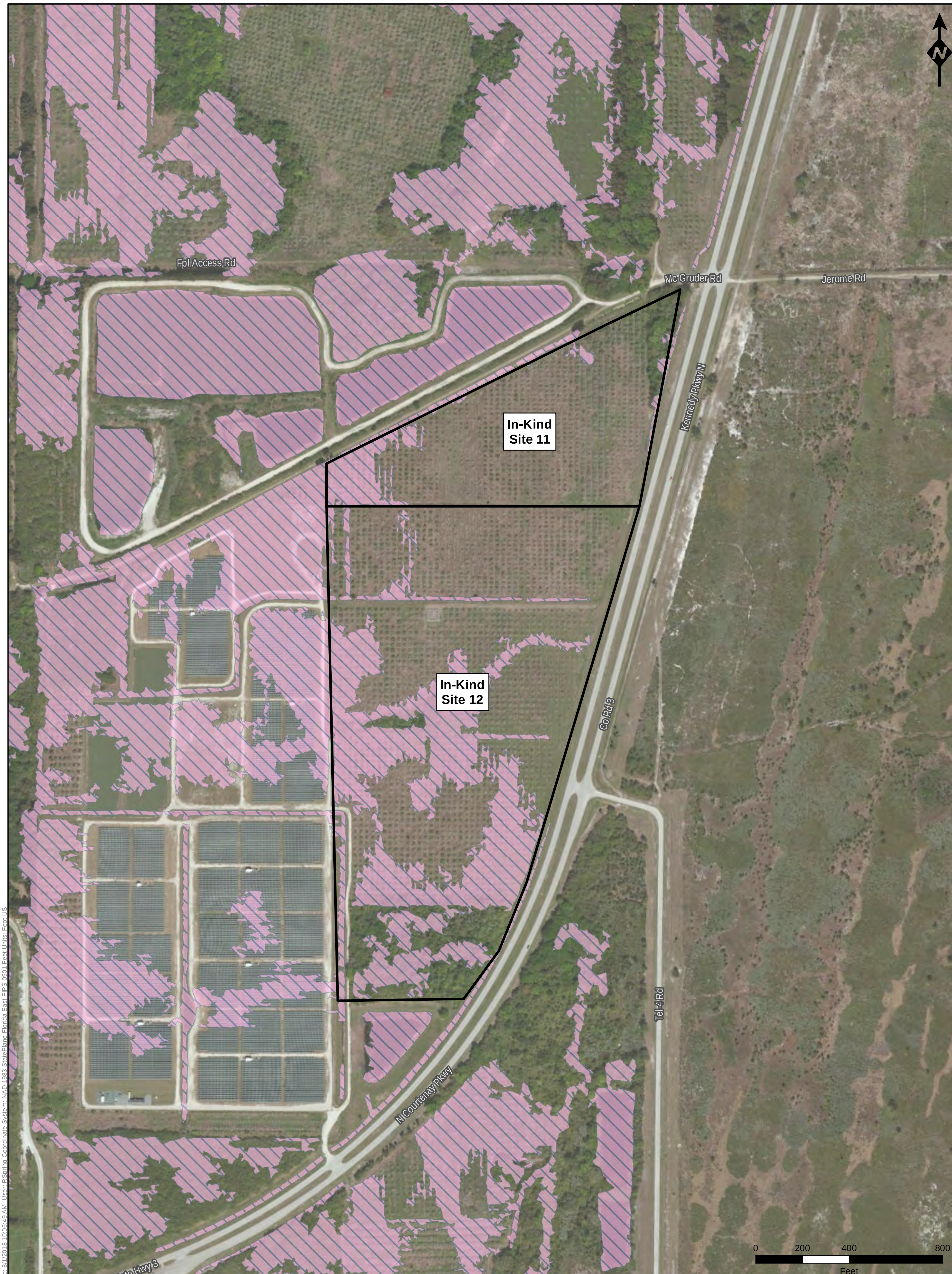

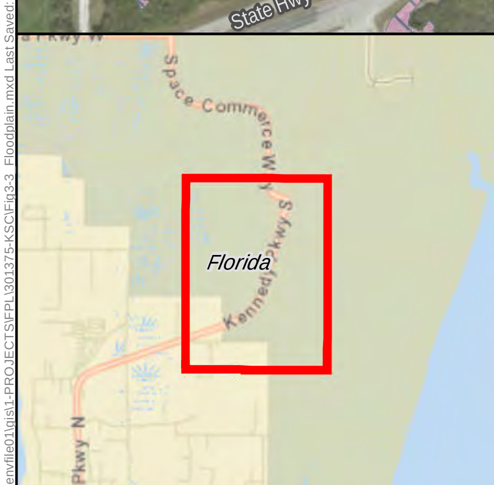

Site Location Boundary

100-Year Floodplain (Zone AE)

Notes:

Basemap acquired from Esri "World Imagery (Clarity)" online service layer, accessed May 2018.

Project Site Boundary developed from Parcel boundaries provided in KMZ format by FPL, April 2018. KMZ file was converted by TRC for GIS functionality.

Floodplain data acquired from Federal Emergency Management Agency (FEMA) National Flood Hazard Layer (NFHL), published date 2018-01-19.

Scale: 1:4,800
(Sheet @11"x17")
1 inch = 0.08 miles
1 inch = 400 feet

FPL

FIGURE 3-3D
(Sheet 5 of 5)
FLORIDA POWER & LIGHT
KENNEDY SPACE CENTER
FLOODPLAINS
BREVARD COUNTY, FLORIDA

CREATED:
8/1/2018

TRC
Results you can rely on

4155 SHACKLEFORD RD
SUITE 225
NORCROSS, GA 30093

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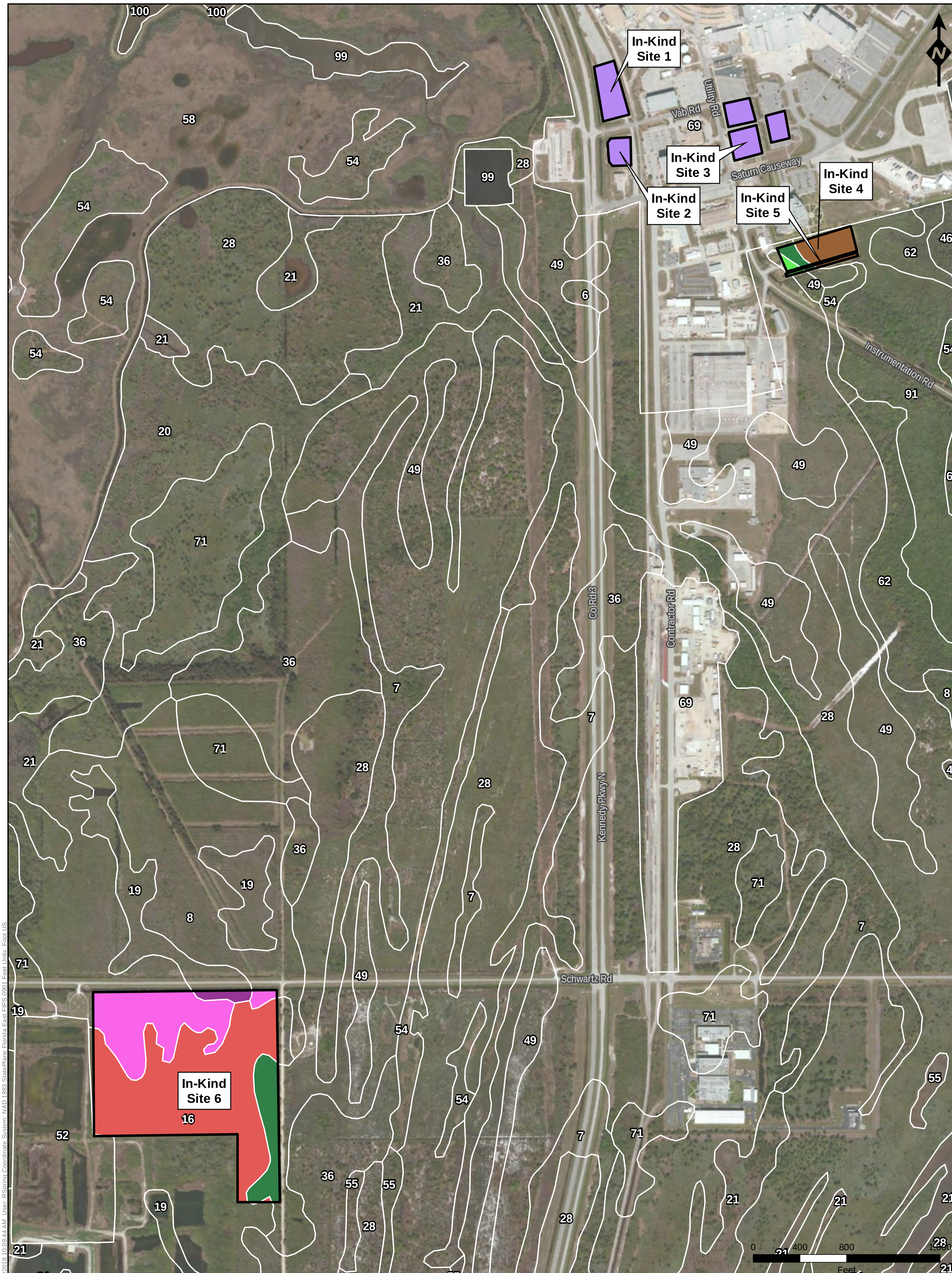
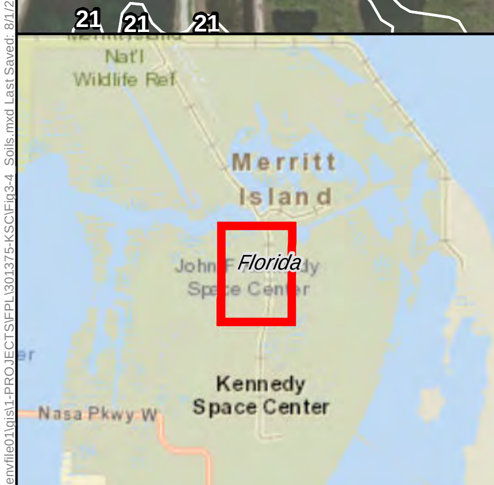




Site Location Boundary

Soil Type Boundary

Soil Type in Project Area:

- 8: Bradenton fine sand, limestone substratum
- 16: Copeland-Bradenton-Wabasso complex, limestone substratum
- 19: Riviera sand, 0 to 2 percent slopes
- 28: Immokalee sand, 0 to 2 percent slopes
- 49: Pomello sand
- 52: Quartzipsamments, smoothed
- 69: Urban land
- 91: Anclote sand

Notes:

Basemap acquired from Esri "World Imagery (Clarity)" online service layer, accessed May 2018.

Project Site Boundary developed from Parcel boundaries provided in KMZ format by FPL, April 2018. KMZ file was converted by TRC for GIS functionality.

Soil Survey Geographic (SSURGO) database for Brevard County, Florida data acquired from the U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), Publication Date: 2016-09-20; Downloaded Date: 2018-04-05; (https://websoilsurvey.sc.egov.usda.gov/)

Scale: 1:9,600
(Sheet @11"x17")
1 inch = 0.15 miles
1 inch = 800 feet

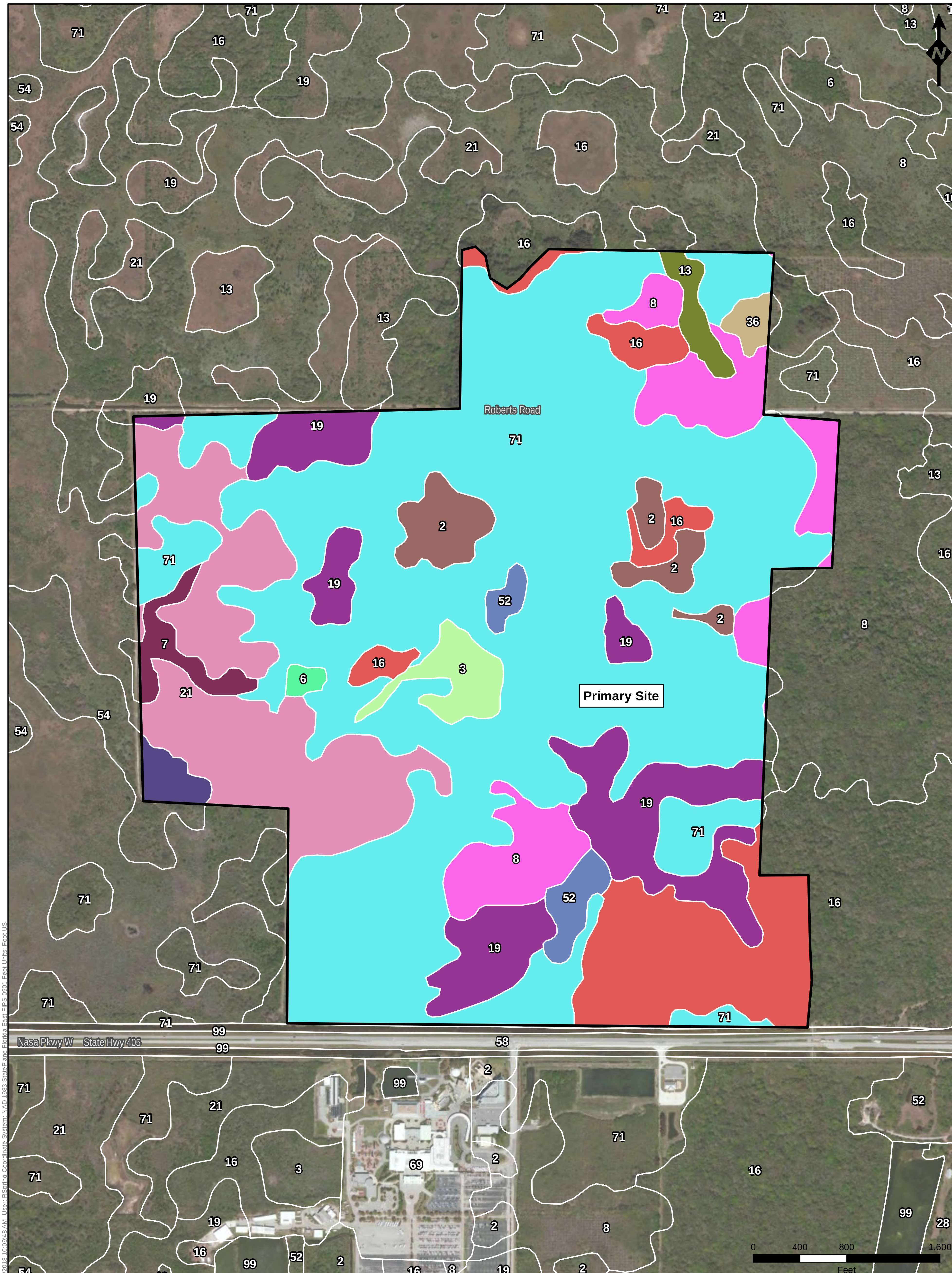
FPL

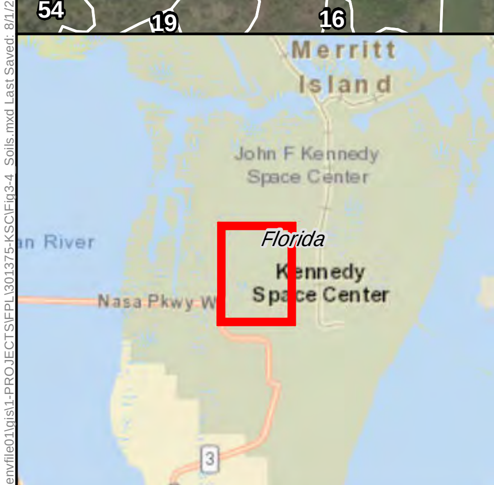
FIGURE 3-4
(Sheet 1 of 4)
FLORIDA POWER & LIGHT
KENNEDY SPACE CENTER
SOILS
BREVARD COUNTY, FLORIDA

CREATED: 8/1/2018

TRC Results you can rely on

4155 SHACKLEFORD RD
SUITE 225
NORCROSS, GA 30093





Site Location Boundary
Soil Type Boundary
Soil Type in Project Area:
- 2: Anclote sand, frequently ponded, 0 to 1 percent slopes
- 3: Anclote sand, frequently flooded
- 6: Basinger sand, depressional
- 7: Basinger sand
- 8: Bradenton fine sand, limestone substratum
- 13: Chobee mucky loamy fine sand, depressional
- 16: Copeland-Bradenton-Wabasso complex, limestone substratum
- 19: Riviera sand, 0 to 2 percent slopes
- 21: Riviera and Winder soils, depressional
- 36: Myakka sand, 0 to 2 percent slopes
- 52: Quartzipsamments, smoothed
- 54: St. Johns sand, 0 to 2 percent slopes
- 71: Wabasso sand, 0 to 2 percent slopes
- 99: Water

Notes:
Basemap acquired from Esri "World Imagery (Clarity)" online service layer, accessed May 2018.

Project Site Boundary developed from Parcel boundaries provided in KMZ format by FPL, April 2018. KMZ file was converted by TRC for GIS functionality.

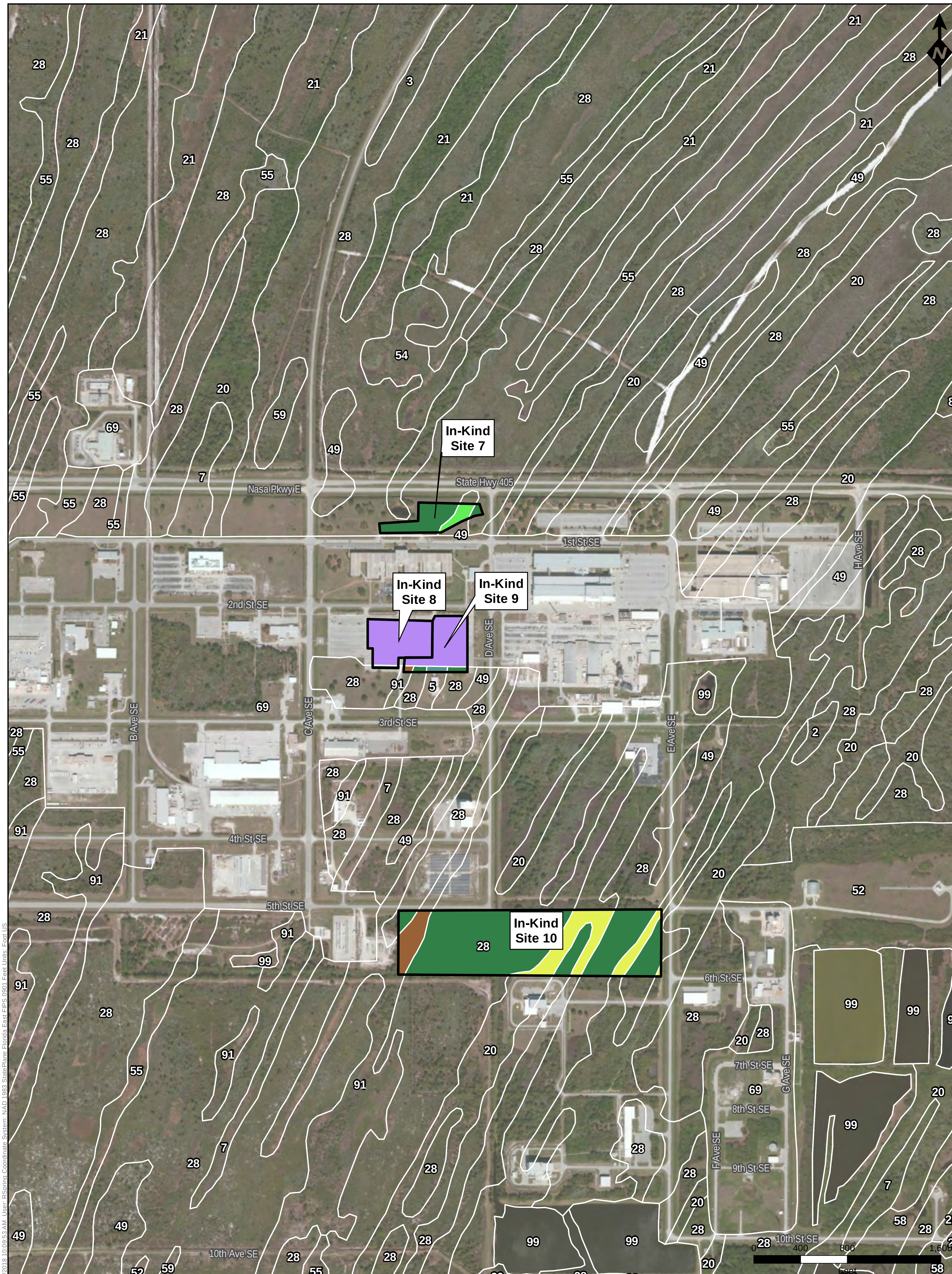
Soil Survey Geographic (SSURGO) database for Brevard County, Florida data acquired from the U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), Publication Date: 2016-09-20; Downloaded Date: 2018-04-05; (https://websoilsurvey.sc.egov.usda.gov/)

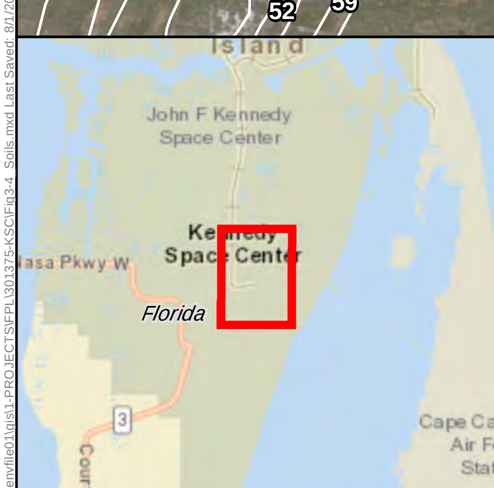
Scale: 1:9,600
(Sheet @11"x17")
1 inch = 0.15 miles
1 inch = 800 feet

FIGURE 3-4
(Sheet 2 of 4)
FLORIDA POWER & LIGHT
KENNEDY SPACE CENTER
SOILS
BREVARD COUNTY, FLORIDA

CREATED: 8/1/2018

4155 SHACKLEFORD RD
SUITE 225
NORCROSS, GA 30093





Site Location Boundary

Soil Type Boundary

Soil Type in Project Area:

- 5: Candler-Urban land complex
- 20: Riviera and Winder soils
- 28: Immokalee sand, 0 to 2 percent slopes
- 49: Pomello sand
- 69: Urban land
- 91: Anclote sand

Notes:

Basemap acquired from Esri "World Imagery (Clarity)" online service layer, accessed May 2018.

Project Site Boundary developed from Parcel boundaries provided in KMZ format by FPL, April 2018. KMZ file was converted by TRC for GIS functionality.

Soil Survey Geographic (SSURGO) database for Brevard County, Florida data acquired from the U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), Publication Date: 2016-09-20; Downloaded Date: 2018-04-05; (https://websoilsurvey.sc.egov.usda.gov/)

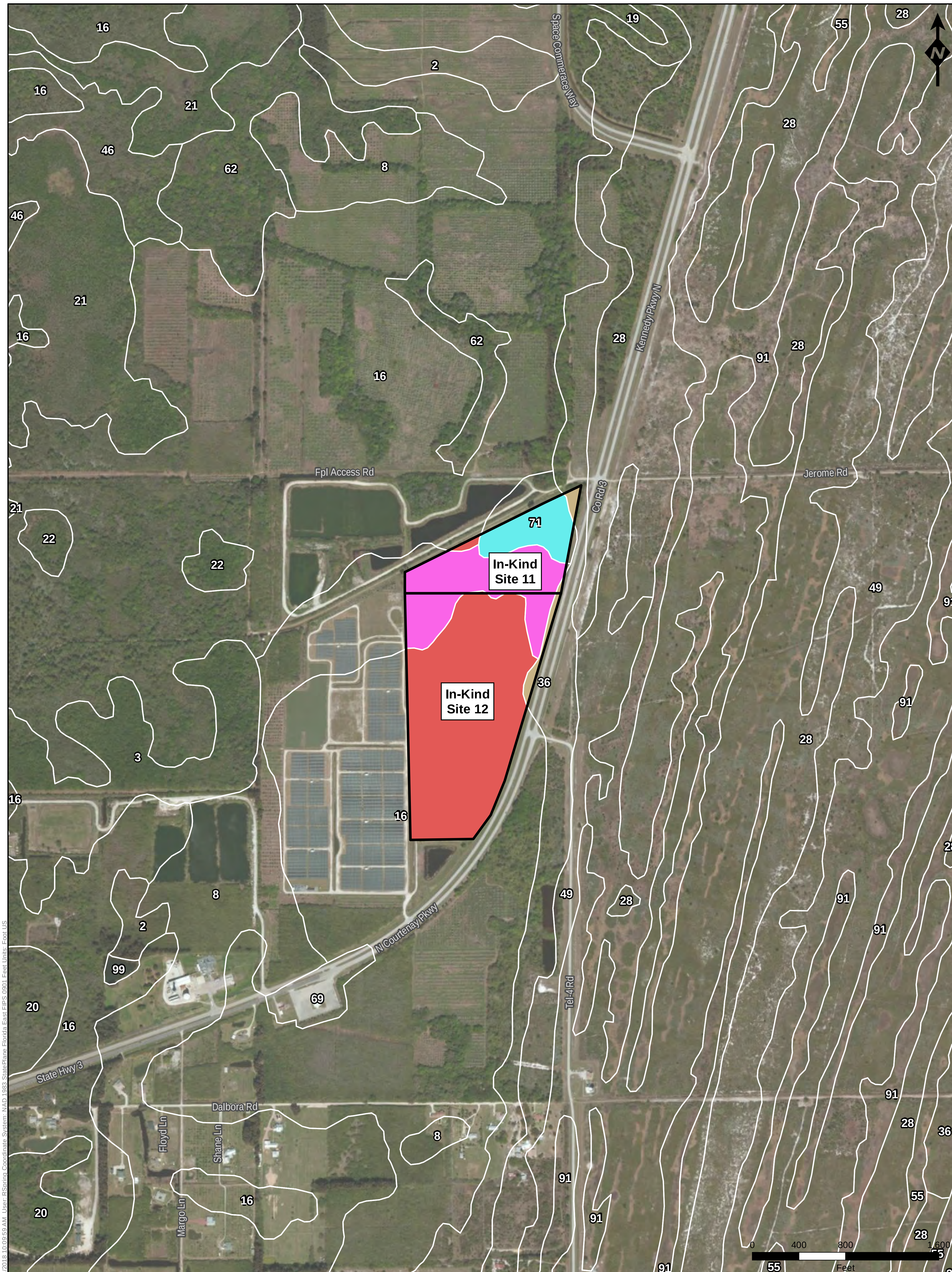
Scale: 1:9,600
(Sheet @11"x17")
1 inch = 0.15 miles
1 inch = 800 feet

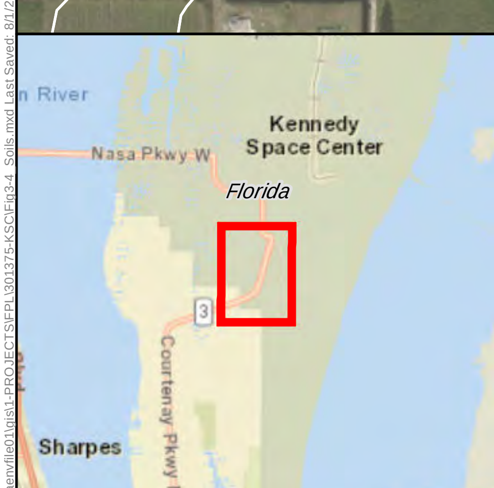
FPL

FIGURE 3-4
(Sheet 3 of 4)
FLORIDA POWER & LIGHT
KENNEDY SPACE CENTER
SOILS
BREVARD COUNTY, FLORIDA

CREATED: 8/1/2018

TRC Results you can rely on
4155 SHACKLEFORD RD
SUITE 225
NORCROSS, GA 30093





Site Location Boundary

Soil Type Boundary

Soil Type in Project Area:

8: Bradenton fine sand, limestone substratum

16: Copeland-Bradenton-Wabasso complex, limestone substratum

36: Myakka sand, 0 to 2 percent slopes

71: Wabasso sand, 0 to 2 percent slopes

Notes:
Basemap acquired from Esri "World Imagery (Clarity)" online service layer, accessed May 2018.

Project Site Boundary developed from Parcel boundaries provided in KMZ format by FPL, April 2018. KMZ file was converted by TRC for GIS functionality.

Soil Survey Geographic (SSURGO) database for Brevard County, Florida data acquired from the U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), Publication Date: 2016-09-20; Downloaded Date: 2018-04-05; (https://websoilsurvey.sc.egov.usda.gov/)

Scale: 1:9,600
(Sheet @11"x17")
1 inch = 0.15 miles
1 inch = 800 feet

FPL

FIGURE 3-4
(Sheet 4 of 4)
FLORIDA POWER & LIGHT
KENNEDY SPACE CENTER
SOILS
BREVARD COUNTY, FLORIDA

CREATED: 8/1/2018

TRC Results you can rely on

4155 SHACKLEFORD RD
SUITE 225
NORCROSS, GA 30093

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Appendix A
Air Quality Analysis Tables

CO2 avoided from a 74.5 MW solar site in Brevard County, FL

MW	74.5
Capacity Factor	26.7%
MWhs/year	174,250
CO2 rate (lbs/MWh)	1306
Total tons CO2 avoided	**113,785**
Equivalent passenger cars off the road for one year	22,104

Notes: CO2 rate based on actual calculated avoided emissions from DeSoto solar, as reported to FPSC; equivalent cars off road from EPA's GHG calculator.

Prepared by Florida Power & Light Company, 2018

Table A.1: NextEra Kennedy Space Center
74.5 MW Solar Site Construction Equipment Criteria Pollutant Emissions

Nonroad Equipment Type/ *On Road Vehicle Type*	Fuel	NONROAD SCC[1] *ONROAD Year/ State/ Vehicle Type/ Fuel/ Road Type* [2]	Engine Rating (hp)	Load Factor	Pollutant Emission Factor (g/hp-hr)[3] *(g/mile)* [4]						Equipment Operating Schedule		Pollutant Emissions (tons)					
					CO	NO_x	SO_2	VOC	PM_{10}	$PM_{2.5}$	Miles	Hours	CO	NO_x	SO_2	VOC	PM_{10}	$PM_{2.5}$
<u>On Road Vehicles</u>																		
Passenger Trucks	*Diesel*	*2018123123*			*0.85*	*1.24*	*5.8E-3*	*0.16*	*0.05*	*0.05*	95,000		*7.3E-3*	*0.01*	*5.0E-5*	*1.4E-3*	*4.7E-4*	*4.3E-4*
Passenger Trucks	*Gasoline*	*2018123113*			*8.88*	*0.75*	*3.3E-3*	*0.11*	*8.8E-3*	*7.7E-3*	21,000		*0.08*	*6.4E-3*	*2.8E-5*	*9.0E-4*	*7.5E-5*	*6.7E-5*
Total													***0.08***	***0.02***	***7.8E-5***	***2.3E-3***	***5.5E-4***	***5.0E-4***
<u>Off Road Equipment</u>																		
Backhoe	Diesel	2270002066	75	21%	4.56	3.63	5.7E-3	0.69	0.65	0.65		280	0.02	0.02	2.8E-5	3.4E-3	3.2E-3	3.2E-3
CAS TR20 conveyor	Diesel	2270003050	75	21%	5.01	4.41	5.8E-3	0.90	0.71	0.71		330	0.03	0.03	3.3E-5	5.2E-3	4.1E-3	4.1E-3
Disker	Diesel	2270002081	200	59%	0.60	1.77	4.1E-3	0.18	0.12	0.12		260	0.02	0.06	1.4E-4	6.0E-3	4.0E-3	4.0E-3
Dozer	Diesel	2270002069	130	59%	0.49	1.16	3.9E-3	0.15	0.11	0.11		590	0.02	0.06	1.9E-4	7.7E-3	5.6E-3	5.6E-3
Forklift	Diesel	2270002057	40	59%	0.55	3.35	4.2E-3	0.16	0.08	0.08		2,340	0.03	0.20	2.6E-4	9.9E-3	4.7E-3	4.7E-3
Generator 19-29 KVA	Diesel	2270006005	40	43%	1.40	4.27	4.8E-3	0.35	0.27	0.27		1,280	0.03	0.10	1.2E-4	8.4E-3	6.6E-3	6.6E-3
Generator 6.5-6.9 KW	Diesel	2270006005	10	43%	4.50	4.99	5.4E-3	0.68	0.49	0.49		260	5.5E-3	6.2E-3	6.7E-6	8.4E-4	6.0E-4	6.0E-4
Loader	Diesel	2270002066	232	21%	1.61	3.15	5.0E-3	0.46	0.31	0.31		380	0.03	0.06	1.0E-4	9.4E-3	6.3E-3	6.3E-3
Manlift	Diesel	2270003010	60	21%	4.48	5.08	5.9E-3	0.87	0.63	0.63		40	2.5E-3	2.8E-3	3.3E-6	4.8E-4	3.5E-4	3.5E-4
Pile Driver	Diesel	2270002033	50	43%	2.13	4.55	5.0E-3	0.40	0.36	0.36		3,180	0.16	0.34	3.7E-4	0.03	0.03	0.03
Plate Compactor	Gasoline	2265002009	5	55%	206.89	2.43	0.25	6.54	0.32	0.32		260	0.16	1.9E-3	2.0E-4	5.2E-3	2.5E-4	2.5E-4
2" trash pump	Gasoline	2265006010	5	69%	208.46	2.50	0.25	6.89	0.35	0.35		260	0.21	2.5E-3	2.5E-4	6.8E-3	3.4E-4	3.4E-4
4" Trash Pump	Gasoline	2265006010	10	69%	278.90	2.03	0.22	5.03	0.12	0.12		1,420	3.01	0.02	2.3E-3	0.05	1.3E-3	1.3E-3
Roller, Ride On	Diesel	2270002015	75	59%	1.73	1.75	4.5E-3	0.18	0.23	0.23		260	0.02	0.02	5.7E-5	2.3E-3	2.9E-3	2.9E-3
Roller, DW211D-50	Diesel	2270002015	125	59%	0.64	1.48	4.0E-3	0.17	0.15	0.15		360	0.02	0.04	1.2E-4	4.9E-3	4.4E-3	4.4E-3
Roller, BMP8500	Diesel	2270002015	20	59%	2.36	4.46	5.5E-3	0.45	0.36	0.36		360	0.01	0.02	2.6E-5	2.1E-3	1.7E-3	1.7E-3
Skid Steer	Diesel	2270002072	100	21%	2.80	4.18	5.2E-3	0.72	0.51	0.51		21,260	1.38	2.06	2.6E-3	0.35	0.25	0.25
Tractor	Diesel	2270002066	90	21%	4.56	3.63	5.7E-3	0.69	0.65	0.65		3,060	0.29	0.23	3.6E-4	0.04	0.04	0.04
Trencher, Ditchwitch RT45	Diesel	2270002030	50	59%	1.96	3.50	4.8E-3	0.24	0.23	0.23		360	0.02	0.04	5.6E-5	2.8E-3	2.7E-3	2.7E-3
Trencher, Vermeer T655	Diesel	2270002030	250	59%	0.62	1.81	4.1E-3	0.18	0.12	0.12		360	0.04	0.11	2.4E-4	0.01	7.0E-3	7.0E-3
4 x 4 Diesel Clubcar	Diesel	2270001060	25	21%	5.12	5.11	5.8E-3	1.29	0.77	0.77		37,360	1.11	1.11	1.3E-3	0.28	0.17	0.17
Water truck	Diesel	2270002051	400	59%	0.27	0.82	3.7E-3	0.14	0.04	0.04		2,090	0.14	0.45	2.0E-3	0.07	0.02	0.02
Offroad Equipment Total													**6.78**	**4.99**	**0.01**	**0.92**	**0.56**	**0.56**

Table A.1: NextEra Kennedy Space Center

74.5 MW Solar Site Construction Equipment Criteria Pollutant Emissions

(Continued)

Nonroad Equipment Type/ *On Road Vehicle Type*	Fuel	NONROAD SCC[1] *ONROAD Year/ State/ Vehicle Type/ Fuel/ Road Type*[2]	Engine Rating (hp)	Load Factor	Pollutant Emission Factor (g/hp-hr)[3] *(g/mile)*[4]						Equipment Operating Schedule		Pollutant Emissions (tons)					
					CO	NO_x	SO_2	VOC	PM_{10}	$PM_{2.5}$	Miles	Hours	CO	NO_x	SO_2	VOC	PM_{10}	$PM_{2.5}$

1. User's Guide for the Final NONROAD2005 Model, EPA420-R-05-013, US EPA, December 2005
2. MOVES2014a User Guide, EPA-420-B-15-095, US EPA, November 2015
3. EPA NONROAD2008 run
4. EPA MOVES2014a run

Table A.2: NextEra Kennedy Space Center
74.5 MW Solar Site Construction Equipment Greenhouse Gas and Hazardous Air Pollutant Emissions

Nonroad Equipment Type/ *On Road Vehicle Type*	Fuel	NONROAD SCC[1] *MOVES Year/ State/ Vehicle Type/ Fuel/ Road Type* [2]	Engine Rating (hp)	Load Factor	Pollutant Emission Factor (g/hp-hr)[3] *(g/mile)* [4]					Equipment Operating Schedule		Pollutant Emissions (tons)				
					CO_2	CH_4[5]	N_2O[5]	CO_2e[6]	Total HAPS[7]	Miles	Hours	CO_2	N_2O	CH_4	CO_2e	Total HAPS
On Road Vehicles																
Passenger Trucks	*Diesel*	*2018123123*			689			690	0.03	95,000		6			6	2.8E-4
Passenger Trucks	*Gasoline*	*2018123113*			492			494	0.03	21,000		4			4	2.5E-4
Total												***10***			***10***	***5.3E-4***
Off Road Equipment																
Backhoe	Diesel	2270002066	75	21%	694	0.04	0.02	700	1.2E-02		280	3.37	1.9E-4	8.5E-5	3.40	6.0E-5
CAS TR20 conveyor	Diesel	2270003050	75	21%	693	0.04	0.02	699	1.2E-02		330	3.97	2.3E-4	1.0E-4	4.01	7.1E-5
Disker	Diesel	2270002081	200	59%	536	0.03	0.01	541	1.2E-02		260	18.14	1.0E-3	4.5E-4	18.30	4.2E-4
Dozer	Diesel	2270002069	130	59%	536	0.03	0.01	541	1.2E-02		590	26.75	1.5E-3	6.7E-4	26.99	6.1E-4
Forklift	Diesel	2270002057	40	59%	596	0.03	0.01	601	1.2E-02		2,340	36.26	2.1E-3	9.1E-4	36.58	7.5E-4
Generator 19-29 KVA	Diesel	2270006005	40	43%	589	0.03	0.01	595	1.2E-02		1,280	14.30	8.1E-4	3.6E-4	14.43	3.0E-4
Generator 6.5-6.9 KW	Diesel	2270006005	10	43%	588	0.03	0.01	593	1.2E-02		260	0.72	4.1E-5	1.8E-5	0.73	1.5E-5
Loader	Diesel	2270002066	232	21%	625	0.04	0.02	631	1.2E-02		380	12.76	7.2E-4	3.2E-4	12.87	2.5E-4
Manlift	Diesel	2270003010	60	21%	693	0.04	0.02	699	1.2E-02		40	0.39	2.2E-5	9.7E-6	0.39	6.8E-6
Pile Driver	Diesel	2270002033	50	43%	589	0.03	0.01	594	1.2E-02		3,180	44.40	2.5E-3	1.1E-3	44.79	9.3E-4
Plate Compactor	Gasoline	2265002009	5	55%	1,229	0.07	0.03	1,240	0.0E+0		260	0.97	5.6E-5	2.4E-5	0.98	
2" trash pump	Gasoline	2265006010	5	69%	1,228	0.07	0.03	1,239	0.0E+0		260	1.21	7.0E-5	3.0E-5	1.23	
4" Trash Pump	Gasoline	2265006010	10	69%	1,046	0.06	0.03	1,056	0.0E+0		1,420	11.30	6.5E-4	2.8E-4	11.40	
Roller, Ride On	Diesel	2270002015	75	59%	596	0.03	0.01	601	1.2E-02		260	7.55	4.3E-4	1.9E-4	7.62	1.6E-4
Roller, DW211D-50	Diesel	2270002015	125	59%	536	0.03	0.01	541	1.2E-02		360	15.70	8.9E-4	3.9E-4	15.83	3.6E-4
Roller, BMP8500	Diesel	2270002015	20	59%	595	0.03	0.01	600	1.2E-02		360	2.78	1.6E-4	7.0E-5	2.81	5.8E-5
Skid Steer	Diesel	2270002072	100	21%	624	0.04	0.02	630	1.2E-02		21,260	307.22	0.02	7.7E-3	309.95	6.1E-3
Tractor	Diesel	2270002066	90	21%	694	0.04	0.02	700	1.2E-02		3,060	44.23	2.5E-3	1.1E-3	44.62	7.8E-4
Trencher, Ditchwitch RT45	Diesel	2270002030	50	59%	595	0.03	0.01	601	1.2E-02		360	6.97	4.0E-4	1.7E-4	7.03	1.4E-4
Trencher, Vermeer T655	Diesel	2270002030	250	59%	536	0.03	0.01	541	1.2E-02		360	31.39	1.8E-3	7.9E-4	31.67	7.2E-4
4 x 4 Diesel Clubcar	Diesel	2270001060	25	21%	692	0.04	0.02	698	1.2E-02		37,360	149.59	8.5E-3	3.8E-3	150.92	2.7E-3
Water truck	Diesel	2270002051	400	59%	536	0.03	0.01	541	1.2E-02		2,090	291.64	0.02	7.3E-3	294.23	6.7E-3
Offroad Equipment Total												**1,032**			**1,041**	**2.1E-02**

Table A.2: NextEra Kennedy Space Center
74.5 MW Solar Site Construction Equipment Greenhouse Gas and Hazardous Air Pollutant Emissions
(Continued)

Nonroad Equipment Type/ *On Road Vehicle Type*	Fuel	NONROAD SCC[1] *MOVES Year/ State/ Vehicle Type/ Fuel/ Road Type* [2]	Engine Rating (hp)	Load Factor	Pollutant Emission Factor (g/hp-hr)[3] *(g/mile)* [4]					Equipment Operating Schedule		Pollutant Emissions (tons)				
					CO_2	CH_4[5]	N_2O[5]	CO_2e[6]	Total HAPS[7]	Miles	Hours	CO_2	N_2O	CH_4	CO_2e	Total HAPS

1. User's Guide for the Final NONROAD2005 Model, EPA420-R-05-013, US EPA, December 2005
2. MOVES2014a User Guide, EPA-420-B-15-095, US EPA, November 2015
3. EPA NONROAD2008 run
4. EPA MOVES2014a run
5. Computed from the CO_2 emissions from NONROAD multiplied by ratios of the CH_4 and N_2O to CO_2 from Tables 13.1 and 13.7 (for diesel and gasoline) Tables 12.1 and 12.9.1 (for CNG) in 2017 Climate Registry Default Emission Factors
6. The global warming potentials of CO_2, CH_4, and N_2O are assumed to be 1, 25, and 298, respectively.
7. Emissions factors for on road vehicles from MOVES2014a. Emissions factors for non road equipment from AP 42 Table 3.3-2 (Diesel <600 hp); AP 42 Tables 3.4-3 & 3.4-4 (Diesel ≥600 hp); AP 42 Table 3.2-2 (CNG); computed from the HC emissions from NONROAD multiplied by the ratios of the HAP to VOC ratio for gasoline passenger car from MOVES2014a (gasoline).

Table A.3: NextEra Kennedy Space Center

74.5 MW Solar Site Construction Equipment Fugitive Dust Emissions

Construction area (acre) 703

Dust control efficiency[1] 50%

Activity	Emission Factor (ton/acre-month)		Ref.	Duration (months)	Uncontrolled Emissions (tons)		Controlled Emissions (tons)	
	PM_{10}	**$PM_{2.5}$**			**PM_{10}**	**$PM_{2.5}$**	**PM_{10}**	**$PM_{2.5}$**
Pipeline and Meter Stations								
Construction	1.10E-01	1.10E-02	2, 3	7.0	541	54	271	27
Total Fugitive Dust Emissions					541	54	271	27

1. Water and other approved dust suppressants would be used at construction sites.
2. WRAP Fugitive Dust Handbook, Countess Environmental, September 2006, Table 3-2, level 1, average conditions
3. $PM_{2.5}/PM_{10}$ = 0.10 (WRAP Fugitive Dust Handbook, Section 3.4.1)

Table A.4: NextEra Kennedy Space Center

74.5 MW Solar Site Construction Emissions Summary

Construction Activity	Emissions (Tons)							
	NO_x	SO_2	CO	PM_{10}	$PM_{2.5}$	VOC	CO_2e	Total HAPs
On-road vehicles	0.02	7.8E-05	0.08	5.5E-04	5.0E-04	2.3E-03	10	5.3E-04
Off-road equipment	4.99	0.01	6.78	0.56	0.56	0.92	1,041	0.02
Fugitive dust				270.66	27.07			
Total	5.00	0.01	6.86	271.22	27.63	0.92	1,051	0.02

Notes:

CO = carbon monoxide

CO_2e = carbon dioxide equivalent

CO_2e = carbon dioxide equivalent

HAP = hazardous air pollutant

NO_x = nitrogen oxides

$PM_{2.5}$ = particulate matter with an aerodynamic diameter ≤2.5 µm

PM_{10} = particulate matter with an aerodynamic diameter ≤10 µm

SO_2 = sulfur dioxide

VOC = volatile organic compound

Appendix B
Primary Site Photographs

Photographs 1 and 2. Representative examples of extensive coverage by exotic invasive species Brazilian pepper and cogon grass.

Photographs 3 and 4. Representative examples of interior ditches and Australian pine stands.

Appendix C
In-Kind Site Photographs

Photographs 1 and 2. In-Kind Site 6 – representative examples of dense Brazilian pepper thickets.

Photographs 3 and 4: In-Kind Site 10 wetlands.

Photographs 5 and 6. In-Kind Site 10: pine flatwoods covered in grapevine.

Photographs 7 and 8. In-Kind Sites 11 and 12: representative examples of extensive exotic invasive species coverage by cogon grass and Brazilian pepper.

 

Photographs 9 and 10. In-Kind Sites 11 and 12: hardwood hammock habitat.