Draft

NORTH WALLOPS ISLAND UNMANNED AERIAL SYSTEMS AIRSTRIP ENVIRONMENTAL ASSESSMENT

Prepared for
National Aeronautics and Space Administration
Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA

December 2011

DRAFT ENVIRONMENTAL ASSESSMENT
NORTH WALLOPS ISLAND UNMANNED AERIAL SYSTEMS AIRSTRIP

Lead Agency:	National Aeronautics and Space Administration
Cooperating Agency:	United States (U.S.) Army Corps of Engineers
Proposed Action:	Construction and Operation of an Unmanned Aerial Systems (UAS) Airstrip on North Wallops Island
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Date:	December 2011

Abstract: National Aeronautics and Space Administration (NASA) Goddard Space Flight Center (GSFC) owns and operates Wallops Flight Facility (WFF). The mission of WFF is to support aeronautical research, science technology, and education. Much of the research at WFF is conducted via various carrier systems such as rockets, balloons, and UAS.

In accordance with the National Environmental Policy Act of 1969, NASA has prepared this Environmental Assessment (EA) to analyze the potential environmental consequences of construction and operation of a UAS airstrip on the north end of Wallops Island to support the testing and deployment of existing and future UAS and UAS-based scientific instruments. Under the Proposed Action, WFF would construct a new UAS airstrip that would measure approximately 900 meters (m) (3,000 feet [ft] long [2,500 ft plus an additional 500-ft clear zone]) by 25 m (75 ft) wide; the airstrip would be located entirely within existing restricted airspace, which has been designated by the Federal Aviation Administration (FAA) as R-6604A/B. This EA also includes an evaluation of the No Action alternative; the No Action alternative reflects the *status quo*. This assessment evaluates airspace management; safety; noise; biological resources; topography and soils; water resources; cultural and traditional resources; land use, visual and recreation resources; air quality; hazardous materials, hazardous systems and hazardous waste management; socioeconomics; and transportation.

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ENVIRONMENTAL ASSESSMENT

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EXECUTIVE SUMMARY

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This Environmental Assessment (EA) analyzes the potential environmental consequences resulting from the construction and operation of a new Unmanned Aerial Systems (UAS) airstrip on the north end of Wallops Island located at the National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) in Accomack County, Virginia. This EA provides a description of the UAS currently operating and those proposed for operations at the new airstrip.

PURPOSE AND NEED FOR THE PROPOSED ACTION

The mission of WFF is to support aeronautical research, science, technology, and education. Beginning in the late 1970's, WFF tested UAS for research applications in support of NASA's *Mini-Sniffer* program, which measured upper atmospheric pollution. Starting in 1993 with the *eXperimental Aerial Platform,* proof-of-concept UAS experiments followed. With the objective of developing platform and instrument systems specifically to support Earth science research, 1996 saw flights of extensively instrumented UAS, beginning with BAI Aerospace's *Exdrone*. UAS test and UAS-based research opportunities currently form an important objective of WFF's Suborbital and Special Orbital Projects Directorate and as such, this type of mission requires an unencumbered operating environment. The purpose of the Proposed Action is to provide an adequately-sized UAS airstrip that would be capable of supporting the testing and deployment of existing and future UAS and UAS-based scientific instruments at WFF. Limitations on the size and use of the existing airstrip have driven the requirement for a new, longer, and wider airstrip at WFF to meet UAS test and research operations.

PROPOSED ACTION AND NO ACTION ALTERNATIVE

Under the Proposed Action, WFF would construct an asphalt airstrip measuring approximately 900 meters (m) (3,000 feet [ft] long [2,500 ft plus an additional 500-ft clear zone]). The width of the airstrip would be 25 m (75 ft); additional width would be provided by a grass buffer and cleared areas as needed for a clear line of sight for UAS operators. UAS-based operations typically would be conducted year round during WFF's normal Air Traffic Control tower hours (Monday through Friday, 0600 to 1800). A maximum of 1,040 UAS sortie operations each year would be conducted from the new airstrip. Under the No Action alternative, WFF would not construct or operate a UAS airstrip on north Wallops Island. UAS would continue to operate from the existing south Wallops Island airstrip.

SUMMARY OF POTENTIAL ENVIRONMENTAL IMPACTS

According to the analysis in this EA, implementation of the Proposed Action would result in minor, but long-term impacts to airspace management, biological resources, noise, and water resources. Minor, short-term impacts would be anticipated to socioeconomics and transportation. Negligible impacts would be anticipated to safety; topography and soils; cultural and traditional resources; land use, visual, and recreation; air quality; hazardous materials, hazardous systems and hazardous waste management. Potential cumulative impacts would be anticipated to biological resources in relation to other projects or past activities that have occurred, or may occur, on the north end of Wallops Island. Under the No Action alternative, conditions on the north end of Wallops Island would remain unchanged; UAS would continue to operate from the south Wallops Island airstrip; however, the currently experienced limitations on operations would remain.

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ACRONYMS AND ABBREVIATIONS

Acronyms and Abbreviations

ac	Acre
AGL	Above Ground Level
ANSI	American National Standards Institute
APE	Area of Potential Effects
AQCR	Air Quality Control Region
ARTCC	Air Route Traffic Control Center
ATC	Air Traffic Control
BA	Biological Assessment
BMP	Best Management Practice
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH_4	Methane
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
COA	Certificate of Authorization
CWA	Clean Water Act
cy	cubic yard
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
dB	Decibel
dBA	A-Weighted Decibel
DNL	Day-Night Average Sound Level
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FACSFAC	Fleet Area Control and Surveillance Facility
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FMC	Fishery Management Council
FONPA	Finding of No Practicable Alternative
FONSI	Finding of No Significant Impact
ft	foot/feet
FUDS	Formerly Used Defense Sites
FY	Fiscal Year
GHG	Greenhouse Gas
GSA	General Services Administration
GSFC	Goddard Space Flight Center
GTM	Generic Transport Model
GWP	Global Warming Potential
ha	hectare
HAP	Hazardous Air Pollutants
JP	Jet Propellant
kg	Kilogram
km	Kilometer
lbs	Pounds
LID	Low Impact Development
L_{max}	Maximum Sound Level
m	meter
m^3	cubic meter
MARS	Mid-Atlantic Regional Spaceport
MEC	Munitions and Explosives of Concern
mi	Mile
MSDS	Material Safety Data Sheet
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
NAAQS	National Ambient Air Quality Standards
NACA	National Advisory Committee for Aeronautics
NAOTS	Naval Air Ordnance Test Station
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NHTSA	National Highway Traffic Safety Administration
NMFS	National Marine Fisheries Service
N_2O	Nitrous Oxide
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NOAA	National Oceanographic and Atmospheric Administration
NOTAM	Notice to Airmen
NOTMAR	Notice to Mariners
NPR	NASA Procedural Requirements
NPS	National Park Service
NRCS	National Resources Conservation Service

NRHP	National Register of Historic Places
O_3	Ozone
OPAREA	Operating Area
Pb	Lead
PM_{10}	Particulate Matter 10 microns or less in diameter
$PM_{2.5}$	Particulate Matter 2.5 microns or less in diameter
ppb	Parts per billion
ppm	Parts per million
R-	Restricted Area
RCRA	Resources Conservation and Recovery Act
RSM	Range Safety Manual
SEL	Sound Exposure Level
SHPO	State Historic Preservation Office
SO_2	Sulfur Dioxide
SO_x	Sulfur Oxides
SRIPP	Shoreline Restoration and Infrastructure Protection Program
TBT	Tributyltin
TSDF	Treatment, Storage, and Disposal Facility
UAS	Unmanned Aerial System
U.S.	United States
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VAC	Virginia Administrative Code
VACAPES	Virginia Capes
VDCR	Virginia Department of Conservation and Recreation
VDEQ	Virginia Department of Environmental Quality
VDGIF	Virginia Department of Game and Inland Fisheries
VDHR	Virginia Department of Historic Resources
VMRC	Virginia Marine Resources Commission
VOC	Volatile Organic Compound
W-	Warning Area
WFF	Wallops Flight Facility
WS	Wildlife Services
$\mu g/m^3$	micrograms per cubic meter

CHAPTER 1

PURPOSE AND NEED FOR THE PROPOSED ACTION

CHAPTER 1
PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 INTRODUCTION

The Space Act of 1958 (as amended) was the United States (U.S.) federal statute that created the National Aeronautics and Space Administration (NASA). The Space Act gave the responsibility for planning, directing, and conducting the nation's civilian space program and aeronautics and aerospace research activities to NASA (NASA 2008a). It also gave NASA the authorization to enter into cooperative agreements, leases, and contracts with public and private entities in the use of NASA's services, equipment, and facilities in support of scientific research and discovery. The Space Act was recodified in 2010 and is now referred to as the "National Aeronautics and Space Act."

NASA Goddard Space Flight Center (GSFC) owns and operates NASA Wallops Flight Facility (WFF). WFF is located in the northeast portion of Accomack County, Virginia on the Delmarva Peninsula. The facility is comprised of three separate land masses: the Main Base, Wallops Mainland, and Wallops Island (Figure 1). The Main Base comprises approximately 720 hectares (ha) (1,800 acres [ac]) and includes offices, laboratories, maintenance and service facilities, a N ASA-owned airport, air traffic control facilities, hangars, runways, aircraft maintenance and ground support buildings, and water and sewage treatment plants. Wallops Mainland consists of approximately 40.5 ha (100 ac) with long-range radar, communications, and optical tracking installations. Wallops Island comprises approximately 1,680 ha (4,600 ac), most of which is marshland, and includes launch and testing facilities, rocket storage buildings, assembly shops, and other related support structures.

The mission of WFF is to support aeronautical research, science, technology, and education. WFF provides NASA and other U.S. government agencies, as well as foreign and commercial organizations access to resources such as special use (i.e., controlled/restricted) airspace, runways, and launch pads, as well as the technical expertise and project oversight to conduct a wide-variety of scientific research in a low-cost environment. Much of the research at WFF is conducted via various carrier systems such as rockets, balloons, manned aircraft, and unmanned aerial systems (UAS).

WFF's Suborbital and Special Orbital Projects Directorate is responsible for management of Wallops Research Range located on Wallops Island. The Research Range is where the majority of scientific research launch activities occur. To support suborbital missions, restricted airspace (R-) 6604A/B was authorized through the Federal Aviation Administration (FAA). Restricted airspace is established when it is determined necessary to confine or segregate activities considered hazardous to nonparticipating aircraft (14 Code of Federal Regulations [CFR] § 1.1). R-6604A/B, owned and operated by WFF, is available 24 hours a day, 7 days a week, from the surface to unlimited altitude. This restricted airspace covers the entirety of Wallops Island and extends over the Atlantic Ocean for approximately 5.0 kilometers (km) (3 miles [mi]) (Figure 2).

Figure 1. Location of WFF

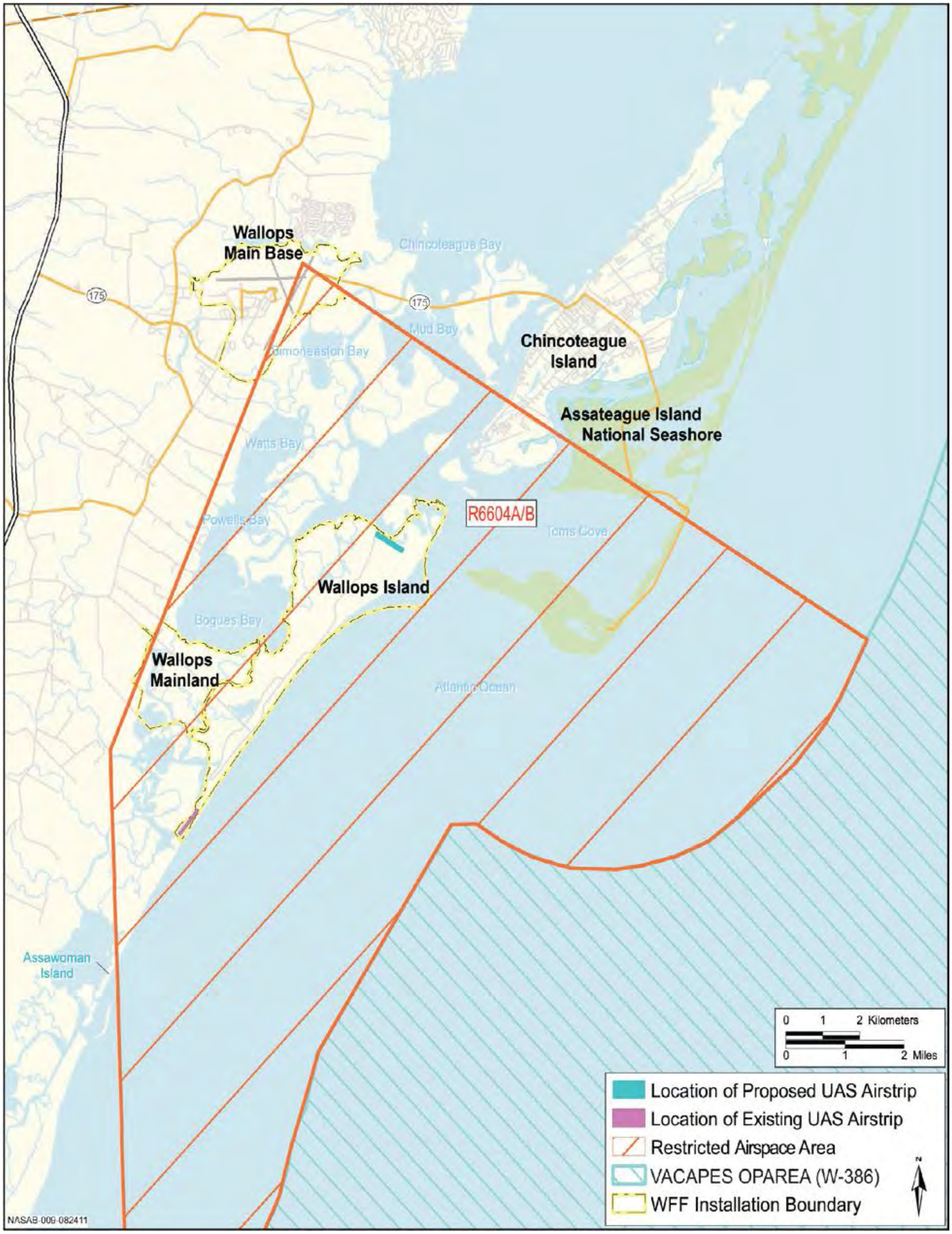

Figure 2. NASA Controlled/Restricted Airspace R-6604A/B and Location of the Existing and Proposed UAS Airstrip

Those UAS launch operations which require restricted airspace, are an important mission at WFF. UAS perform a wide variety of functions; the majority of these functions are some form of remote sensing (*e.g.*, atmospheric monitoring and testing, hurricane analysis, etc.). Commercial UAS manufacturers and others come from around the world to WFF to conduct product trials, pilot training, and science missions from a UAS airstrip located on the south end of Wallops Island (Figure 2). WFF is proposing to construct and operate a new UAS airstrip on the north end of Wallops Island to support the testing and deployment of existing and future UAS and UAS-based scientific instruments. Limitations on the size and use of the existing airstrip have driven the requirement for a new, longer, and wider airstrip at WFF to meet UAS test and research operations.

This Environmental Assessment (EA) has been prepared by NASA in accordance with the requirements of the National Environmental Policy Act (NEPA) of 1969; the Council on Environmental Quality (CEQ) regulations implementing NEPA (Title 40 of the CFR §§ 1500-1508); NASA procedures for implementing NEPA (14 CFR 1216.3); and NASA Procedural Requirements 8580.1 *Implementing the National Environmental Policy Act and Executive Order* (EO) *12114*.

1.2 BACKGROUND FOR PURPOSE AND NEED

In 1945, the National Advisory Committee for Aeronautics (NACA) established a launch site on Wallops Island under the direction of the Langley Research Center. This site was designated the Pilotless Aircraft Research Station and conducted high-speed aerodynamic research to supplement wind tunnel and laboratory investigations into the problems of flight. In 1958, Congress established NASA, which absorbed Langley Research Center and other NACA field centers and research facilities. At that time, the Pilotless Aircraft Research Station became a separate facility and was named Wallops Station. Wallops Station operated directly under NASA Headquarters in Washington, DC. In 1959, NASA acquired the former Chincoteague Naval Air Station on the Main Base, and administrative activities were moved to this location. In 1974, the Wallops Station was renamed Wallops Flight Center. The name was later changed to WFF in 1981 when the installation became part of GSFC in Greenbelt, Maryland. For over 65 years, WFF has launched thousands of research vehicles in the quest for information on the flight characteristics of airplanes, launch vehicles, and spacecraft, and to increase the knowledge of the Earth's upper atmosphere and the near space environment. The research vehicles vary in size and power from small UAS to orbital class rockets.

The employment of UAS in earth science research has increased significantly in the last decade. WFF has been in the forefront of these efforts. In fact, the first UAS to fly into a tropical storm system in the Atlantic took off from Wallops Island in 2005. These efforts have not escaped the notice of the scientific community. In its 2007 Decadal Survey for Earth Sciences, the National Academy of Sciences recommended that NASA increase its suborbital capabilities and that NASA should lead in exploiting unmanned aerial vehicle technology. The survey went on to say that "…unmanned aerial vehicle technology should increasingly be factored into the nation's strategic plan for Earth Science." In the same year, appropriations committees from both Houses of Congress urged NASA to utilize UAVs in pursuit of Earth Science research. The House committee advocated expansion of the existing NASA UAS program. The Senate committee strongly encouraged NASA to continue a 2006 effort to utilize the unique assets and location of WFF to begin a program where UAS would be utilized to achieve the key objectives of the Earth Science Decadal Survey in fiscal year 2008. Over the last two years, NASA WFF has invested nearly $5 million in Congressionally-directed funds to develop and demonstrate advances in Earth Science instruments and small UAS support systems to conduct research previously requiring large piloted aircraft. A highly miniaturized Laser Identification Detection and Ranging system flown on a small UAS platform has recently collected data that is expected to enable a new class of low-cost terrain mapping science missions, many of which are expected to occur from WFF.

In addition to NASA's role in furthering earth science research, the agency has assumed an active role in UAS flight testing and validation. There are currently two bills in Congress (the FAA Reauthorization Act and the National Defense Authorization Act) which would mandate the establishment of four to six UAS test sites in the United States. The purpose of these sites would be to support the integration of UAS into the National Airspace System (NAS). In an October 19, 2011, letter, four members of Virginia's congressional delegation suggested that, given its experience with UAS operations and its existing support infrastructure, WFF is an ideal location for one of these test ranges. This designation, if received, is expected to lead to a significant growth in requests from other Federal agencies (e.g., FAA, Department of Defense [DoD]) and commercial developers to conduct UAS operations from WFF. Accordingly, NASA is proposing to expand its UAS operations at WFF in response to these directives as well as the growing needs of its existing user base.

Figure 3 provides the most common and largest UAS that currently operate from the south Wallops Island airstrip. Table 1 provides an overview of the various UAS models. As shown in Table 1, the Viking 100- and 300- class vehicle models require a 450 m (1,500 ft) airstrip for safe takeoff and landing and are therefore the largest UAS capable of operating from the existing airstrip. The Viking 400-class vehicle model is proposed for future operations at WFF.

AEROSONDE
(currently operating)

- Length is approximately 1.5 m (5.6 ft); wingspan is 3.0 m (9.5 ft)
- Maximum weight with payload is 14 kilograms (30 pounds)
- Operates at a cruising speed of 111 kilometers per hour (60 knots)
- Endurance: 30 hours
- Power: 1.2 kilowatts
- Runway Requirement: none

GTM AirSTAR
(currently operating)

- Length is approximately 2.5 m (8.0 ft); wingspan is 2.0 m (7.0 ft)
- Maximum weight with payload is 23 kilograms (50 pounds)
- Operates at a cruising speed of 121 kilometers per hour (65 knots)
- Endurance: 10 - 12 minutes
- Power: Turbine Engine
- Runway Requirement: 450m (1,500 ft)

Viking 100
(currently operating)

- Length is approximately 2.5 m (8.0 ft); wingspan is 4.5 m (15.0 ft)
- Maximum weight with payload is 68 kilograms (150 pounds)
- Operates at a cruising speed of 102 kilometers per hour (55 knots)
- Endurance: 10 - 14 hours
- Power: 16 horsepower
- Runway Requirement: 450m (1,500 ft)

Viking 300
(currently operating)

- Length is approximately 4.0 m (13.5 ft); wingspan is 5.5 m (17.5 ft)
- Maximum weight with payload is 144 kilograms (318 pounds)
- Operates at a cruising speed of 104 kilometers per hour (56 knots)
- Endurance: 8-10 hours
- Power: 25 horsepower
- Runway Requirement: 450m (1,500 ft)

Viking 400
(future operations)

- Length is approximately 4.5m (14.7 ft); wingspan is 6.0 m (20.0 ft)
- Maximum weight with payload is 240 kilograms (530 pounds)
- Operates at a cruising speed of 111 kilometers per hour (60 knots)
- Endurance: 8-12 hours
- Power: 38 horsepower
- Runway Requirement: 760m (2,500 ft)

Figure 3. UAS Currently Operating and Proposed for Future Operations at WFF

Table 1. UAS Operating and Proposed for Operations at WFF

Model/Class of Vehicle	*Wingspan (m/ft)*	*Length (m/ft)*	*Maximum Weight with Payload (kg/lbs)*	*Minimum Airstrip Requirement (m/ft)*	*Power*	*Maximum Airspeed (kph/knots)*	*Endurance (hours)*
Aerosonde[1]	3.0/9.5	1.5/5.6	14/30	none	1.2 kilowatt-electric	115/62	40
GTM AirSTAR[2]	2.0/7.0	2.5/8.0	23/50	450/1,500	Turbofan engine	120/65	10-12 minutes
Viking 100[3]	4.5/15.0	2.5/8.0	68/150	450/1,500	16 horsepower	102/55	10-14
Viking 300[3]	5.5/17.5	4.0/13.5	144/318	450/1,500	25 horsepower	104/56	8-10
Viking 400[3]	6.0/20.0	4.5/14.7	240/530	760/2,500	38 horsepower	111/60	8-12
Exdrone[4]	3.0/9.5	2.0/6.2	2/6	100/300	8 horsepower	144/78	2
Scan Eagle[5]	3.0/9.5	2.0/5.6	2/6	10/30	1.2 kilowatt-electric	204/110	40
Shadow 200[6]	6.0/20.0	4.0/12.0	4/12	30/500	38 horsepower	130/70	4
Blimp (tethered)	2.0/7.0	7.0/23.0	7/23	none	n/a	n/a	n/a

Notes: [1] Manufactured by Aerosonde. [2] GTM (Generic Transport Model) AirSTAR is manufactured by NASA Langley Research Center. The GTM is similar to an upscale model airplane and is the smallest of the UAS piloted at WFF. [3] Manufactured by L3 BAI Systems. [4] Launched via catapult; stopped by chute or skid. [5] Launched via catapult; stopped via SkyHook. [6] Launched via catapult; wheel landing. kg=kilogram, lbs=pounds, kph=kilometers per hour.

Since 2003, UAS have been operating from an airstrip on a then remote portion of south Wallops Island. The airstrip (Figure 4), formerly a paved road, measured 230 m long by 15 m wide (750 ft long by 50 ft wide). In 2005, the airstrip was expanded to accommodate larger classes of UAS. The airstrip was lengthened to 450 m (1,500 ft); two staging pads were also added (Figure 5). While this airstrip met an immediate and emerging need, the location has proven to be insufficient for continued UAS flight operations.

Figure 4. Initial UAS Airstrip (2003)

Figure 5. Expanded UAS Airstrip (2005)

Providing the facilities and support services for UAS as a platform for scientific instruments is a primary function of WFF's suborbital research program. UAS technologies have matured since the 1980s and 1990s, as has the interest in the use of UAS as platforms for scientific research. WFF has the capability to provide the necessary services (i.e., restricted airspace, airstrip, and oversight) in a low-cost environment to support a growing UAS test and UAS-based research environment.

1.3 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.3.1 Purpose

The purpose of the Proposed Action is to provide an adequately-sized UAS airstrip that would be capable of supporting the testing and deployment of existing and future UAS and UAS-based scientific instruments at WFF. UAS test and UAS-based research opportunities form an important objective of WFF's Suborbital and Special Orbital Projects Directorate and as such, this type of mission requires an unencumbered operating environment.

1.3.2 Need

A new airstrip at north Wallops Island is needed to support WFF's ongoing and future UAS and UAS-based test research. Limitations on use of the existing UAS airstrip, as presented below, have inhibited opportunities for scientific testing and research at WFF.

- The airstrip has a north/south orientation making it susceptible to (east/west) cross winds. Due to the small size and light weight of most UAS, strong east/west winds often preclude and/or limit UAS operations. Historical wind data for Wallops Island indicates that winds are generally from the west/northwest or east/southeast directions (NASA 2010a).
- During storm events, the existing airstrip is often inundated with surf and sand. Severe beach erosion from hurricanes and nor'easters (as evident in Figure 6) has virtually eliminated the beachfront and dunes that provided protection in the past. Although, WFF is in the process of restoring the Wallops Island shoreline (NASA 2010b), the beach restoration project will not prevent storm driven flood waters from the back bays from inundating the existing UAS airstrip.
- WFF's rocket launch program has expanded with the current construction of a new launch pad north of the UAS airstrip. Mandatory safety constraints from increased rocket launch activities at the nearby Mid-Atlantic Regional Spaceport (MARS) are anticipated to further reduce UAS research opportunities. The airstrip is inactivated prior to and immediately following rocket launch activities and static test firing of the rocket engines. Approximately 18 orbital launches, 60 sounding rockets, and 2 static test firing of rockets would occur each year (NASA 2009a). Each of these activities has the potential to reduce opportunities for UAS flight operations from the existing airstrip (see Figure 8).
- The existing airstrip (450 m [1,500 ft] long) is not capable of supporting the next generation of UAS. The Viking 400-class UAS would require, at a minimum, a 760 m (2,500 ft) long airstrip; an additional 75 m (250 ft) clearance zone on each end would provide for safe operations.

Figure 6. South Wallops Island UAS Airstrip after a Storm

Based on the limitations presented, the requirement to operate UAS in restricted airspace, and WFF's Suborbital and Special Orbital Projects Directorate's mission to provide the infrastructure and support services for scientific research and discovery, NASA has determined the need to construct a new UAS airstrip on the north end of Wallops Island.

1.4 LEAD AND COOPERATING AGENCIES

NASA is the proponent for the North Wallops Island airstrip and is the lead agency for preparation of this EA. The U.S. Army Corps of Engineers (USACE) is a co operating agency. As defined in 40 CFR § 1508.5, and further clarified in subsequent Council on Environmental Quality memoranda, a cooperating agency can be any Federal, state, Tribal, or local government which has jurisdiction by law or special expertise regarding any environmental impact involved in a proposal or a reasonable alternative.

USACE is a cooperating agency because they possess both regulatory authority and specialized expertise pertaining to the Proposed Action. Under Section 404 of the Clean Water Act (CWA), the USACE has jurisdiction over the disposal of dredged and fill material in Waters of the U.S., including wetlands.

CHAPTER 2

DESCRIPTION OF THE PROPOSED ACTION AND NO ACTION ALTERNATIVE

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This chapter describes the WFF proposal to construct and operate a new UAS airstrip on the north end of Wallops Island in Accomack County, Virginia. The new airstrip would measure approximately 900 m (3,000 ft long [2,500 ft plus an additional 500 ft clear zone]) by 25 m (75 ft) wide and would be located entirely within existing restricted airspace R-6604A/B (refer to Figure 2).

Section 2.1 describes the process used to identify alternatives to be analyzed in this EA as well as those eliminated from further study. Section 2.2 presents the Proposed Action. Section 2.3 describes the No Action alternative as required by CEQ regulations; the No Action alternative reflects the *status quo*. Alternatives to the Proposed Action were considered; however, no other location at WFF would meet the overall purpose and need.

2.1 ALTERNATIVE IDENTIFICATION PROCESS

WFF defined six criteria to identify reasonable alternatives. Based on fulfilling the purpose and need for the Proposed Action, WFF determined that a reasonable alternative must meet the following criteria:

- Meet the needs of the GSFC UAS scientific and research community;
- Provide a location on WFF in which all UAS departures, landings, and operations are within controlled/restricted airspace;
- Limit conflicts with other WFF or WFF-tenant mission objectives and activities;
- Ensure the dimensions (i.e., length and width) of the airstrip are sufficient to accommodate existing and future planned UAS;
- Ensure the UAS airstrip is oriented to maximize use of the prevailing winds in the region; and
- Provide operational safety.

While the following criteria and their applications were used to determine the optimal location for the new UAS airstrip at WFF, the criteria were also applied in considering alternative locations outside of the boundaries of WFF.

Criterion 1: Meet the Needs of the GSFC UAS Scientific and Research Community

Each NASA Center is directed to meet the needs of the scientific and research community as provided in the recodified National Aeronautics and Space Act of 2010. GSFC is the NASA Center of Excellence for Earth Science Research and conducts studies involving the coastal zone, hurricane tracking, and instrument validation. As WFF is a GSFC facility, the administrative burden for GSFC scientists working at WFF is greatly reduced. Additionally, at approximately 260 km (160 mi) from GSFC, WFF is extremely convenient and cost-effective for GSFC scientists performing research and testing scientific instrumentation. Use of other facilities or NASA Centers for UAS-based research and engineering tests would dramatically impact the cost and logistics for the GSFC research community. WFFs UAS capabilities (including airstrip infrastructure) have been developed to support local research missions (e.g., hurricane and oceanography studies) as well as to contribute to remotely deployed campaigns (e.g., arctic ice research). WFF-based UAS operations are critical for tests needed to support both scenarios, as much of the research sensors and instrumentation are developed by GSFC scientists. This matured capability, including the specific ability to launch, test, operate, and recover unique research systems, is a key element in growing utilization of UAS by GSFC scientists, instrument developers, and collaborators. Such new technology would then be used to conduct valuable scientific research at WFF and throughout the world.

Criterion 2: Controlled/Restricted Airspace

The FAA is responsible for overseeing the National Airspace System (NAS), including the safety, security, and efficiency of operations by the military, government, private pilots, and commercial entities. That responsibility extends to the operation of UAS. UAS that have not been certified or authorized by the FAA to operate in the NAS are required to operate (i.e., takeoff, cruise, and land, with appropriate safety margins) in controlled/restricted airspace areas. R-6604A/B is NASA-controlled/restricted airspace that overlies all of Wallops Island, the majority of the Mainland, and a portion of one of three Main Base runways (refer to Figure 2). UAS operating from WFF are not certified or authorized to operate in the NAS unless an approved Certificate of Authorization (COA)[1] has been granted by the FAA. Under a COA, WFF UAS operations could be conducted in the NAS, usually with very strict limitations, under the guidance of Air Traffic Control (ATC).

Criterion 3: Limit Conflicts with other WFF Mission Areas

As shown in Figure 7, multiple launch pads including MARS Expendable Launch Vehicle pads and NASA sounding rocket pads dominate the Island's south end; mid-Wallops Island is dominated by U.S. Navy (Navy) facilities and radar systems along with rocket processing and integration facilities. The lack of these types of operational activities at the Island's north end is evident because this area is dedicated to rocket motor storage and fueling operations. Preparation and launch activities associated with the launch pads occur throughout the year. To meet the expanding needs of the NASA and MARS rocket programs, WFF is proposing to construct a Payload Processing and Fueling Complex approximately 3 km (1.75 mi) from the northern extent of the launch range.

Wallops Mainland lies to the west of the launch range and is connected by Causeway Road (Figure 7); it is the location of large radar, tracking and telemetry systems. Operations on the Main Base are divided between the core campus administrative and processing facilities, which are bounded to the north and east by the airfield.

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[1] A COA is an authorization issued by the FAA for a s pecific UAS activity that requires take-off, flying and/or landing, including the related safety margins, within the NAS. In most cases, FAA will provide a formal response within 60 days from the time a completed application is submitted (FAA 2010).

Figure 7. Various WFF Mission Areas on Wallops Island

Criterion 4: Airstrip Dimension

The airstrip must accommodate the minimum requirement for takeoff and landing of existing and future UAS. The largest UAS that would be authorized to operate from the airstrip is the Viking 400-class of vehicle. The minimum airstrip length for the Viking 400 is 750 m (2,500 ft). Additional area beyond the primary airstrip surface area is also required. This area, the clear zone, extends with the width and length of the primary surface area. Clear zones provide additional clear, typically unpaved surface area to stop an aircraft in the event of a mishap; thereby reducing potential property damage. To provide the necessary area for a Viking 400, a 75 m (250 ft) clear zone would be provided on each end of the airstrip. The width of the airstrip would accommodate the wing span of the largest UAS (i.e., Viking 400) while adding additional surface area to account for drifting off the airstrip centerline due to various conditions, such as wind, weight, or operator controls. WFF determined that an airstrip measuring approximately 900 m (3,000 ft long [2,500 ft plus an additional 500 ft clear zone]) by 25 m (75 ft) wide would meet its needs for a UAS airstrip.

Criterion 5: Airstrip Orientation

Aircraft use the flow of wind over the wings to generate lift in order to fly. By taking off into the wind, the aircraft lifts off sooner and the result is a lower ground speed and a shorter take-off run necessary for the aircraft to become airborne. Landing into the wind has the same advantages; the aircraft would use less of the airstrip and the ground speed would be lower at touchdown. A review of historical wind data for Wallops Island indicates that winds are generally from the west/northwest or east/southeast (NASA 2010a). An airstrip placed in this orientation would provide optimal winds for UAS test and UAS-based research opportunities.

Criterion 6: Operational Flight Safety

Flight safety is generally associated with the containment of vehicle flight within approved operational areas and impacts within planned impact areas. The potential exists for loss of control of a UAS during test flight training. A UAS airstrip from where unproven UAS would operate would need to be confined to an area where there is little probability of a crash injuring people or infrastructure on the ground. As such, an operational UAS airstrip would need to be located in an area where people, vehicles, homes, or businesses would not be found and overflights of these areas would not occur. A 1 km (0.5 mi) safety buffer would be required around the UAS airstrip during test takeoff and landing operations. If this radius is not available, there would be a requirement to temporarily evacuate people in the area, close nearby roads, and shelter people in place during takeoff and landing (personal communication, Patterson 2011).

Alternatives Considered But Not Carried Forward

Off-Site Locations

Numerous off-site alternative locations were considered to determine their viability to conduct UAS test and UAS-based research using criteria developed by WFF. Table 2 provides the results from application of six criteria followed by a brief summary. None of the off-site locations meet the full list of criteria necessary to be considered as practicable alternatives.

Table 2. Application of Screening Criteria for Off-Site Locations

	Criterion 1 *Meet Needs of GSFC UAS Scientific and Research Community*	***Criterion 2*** *Controlled/ Restricted Airspace*	***Criterion 3*** *Limit Conflicts with other WFF Mission Areas*	***Criterion 4*** *Airstrip Dimension*	***Criterion 5*** *Airstrip Orientation*	***Criterion 6*** *Operational Flight Safety*
NASA Langley Research Center/Langley Air Force Base	- / -	- / -	✓	- / ✓	- / ✓	- / ✓
Kennedy Space Center	-	✓	✓	✓	✓	✓
Naval Air Station Patuxent River	-	✓	✓	✓	✓	✓
Accomack County Airport	-	-	✓	✓	✓	-
Land Parcels Adjacent to WFF	-	-	✓	✓	✓	-

Legend: ✓ = yes; - = no.

NASA Langley Research Center (LaRC) and *Langley Air Force Base (LAFB)* are adjacent facilities located in Hampton, Virginia which often cooperate closely and could conceivably work together to conduct UAS operations; therefore, they will be considered as one entity. Though LaRC does have a UAS research group, the Center does not possess the services, equipment, facilities (including runways) that UAS operations require. The GTM AirStar (refer to Figure 3) is manufactured by LaRC; however, the aircraft cannot be operated at the Center; the GTM AirStar is flown exclusively at WFF. LAFB possesses the needed facilities the base does not have the controlled/restricted airspace to support UAS test and UAS-based research operations. Moreover, LAFB is an operational base, meaning that the requirements for a test and research facility would not be provided. Therefore the Air Force Base does not meet Criteria 1 and 2. Lacking the requirements under these Criteria, LaRC/LAFB is not carried forward as an alternative location.

Kennedy Space Center in Florida possesses the services, equipment, facilities, and controlled/restricted airspace to support UAS test and UAS-based research operations as required under Criterion 2 through 6; however, Kennedy Space Center is a different administrative entity from GSFC, the location is remote from WFF, and is not located in the mid-Atlantic region. As such, this location would not meet the needs of the GSFC UAS scientific and research community under Criterion 1. Kennedy Space Center is not carried forward for additional consideration.

Naval Air Station Patuxent River is a U.S. Naval Air Station located on the Chesapeake Bay in St. Mary's County, Maryland approximately 320 km (200 mi) from WFF. The Naval Air Station is the Navy's primary location for research, development, test, evaluation, engineering and fleet support for naval aircraft and systems. Webster Field provides an airstrip and airspace for UAS operations. Overall, the installation would meet the requirements under Criterion 2 through 6; however, the Air Station is not a NASA-supported Center and due to its location, the coastal zone/ocean research objectives would not be available rendering this location unable to meet the needs of the WFF UAS scientific and research community as required under Criterion 1. Accordingly, further consideration of Naval Air Station Patuxent River is not warranted.

Accomack County Airport, located in Melfa, Virginia is approximately 60 km (35 mi) from WFF. The airport has two 1,500 m (5,000 ft) long by 30 m (100 ft) wide north/south runways that would be capable of supporting aircraft of the size proposed at WFF and would meet the requirements under Criteria 3 through 5; however, this location was not considered further since it is not a NASA-supported Center as described under Criterion 1, it does not meet the controlled/restricted airspace requirements as described under Criterion 2, and due to the proximity of business and residential areas within 0.8 km (1 mi) of the airstrip, the location would fail to meet the operational flight safety requirements under Criterion 6. The Accomack County Airport is not considered a viable alternative and is not considered further.

Purchase of off-site land parcels surrounding the entrance to Wallops Mainland and north towards the Main Base was considered; however, these off-site land parcels would be located outside of R-6604A/B, a requirement under Criterion 2. Additionally, UAS operating from WFF are permitted only to operate and fly over areas where people, vehicles, or homes and businesses would not be located and overflights of these areas would not occur. Although rural, the areas around both the Mainland and Main Base are populated. Operating UAS in populated areas and areas located outside of R-6604A/B would pose an unacceptable risk to the public and residential property from mishaps that could occur with untested/unproven UAS; Criterion 6 would not be met resulting in a failure to also meet the requirements under Criterion 1. As such, purchase of off-site land parcels is not considered further.

On-Site Locations

In addition to the criteria developed in Section 2.1, consideration of the magnitude of potential environmental impacts eliminated some on-site alternatives from further consideration. Table 3 provides the results from application of the criteria followed by a brief summary. Figure 8 provides the location of alternatives considered at WFF but not carried forward for detailed analysis; Figure 9 provides more focus of the alternative locations considered on the north end of Wallops Island.

Table 3. Application of Screening Criteria for On-Site Locations

	Criterion 1	***Criterion 2***	***Criterion 3***	***Criterion 4***	***Criterion 5***	***Criterion 6***
	Meet Needs of GSFC UAS Scientific and Research Community	*Controlled/ Restricted Airspace*	*Limit Conflicts with other Mission Areas*	*Airstrip Dimension*	*Airstrip Orientation*	*Operational Flight Safety*
Expansion of Existing UAS Airstrip	-	✓	-	-	-	✓
Causeway Road (Route 803)	✓	✓	-	✓	✓	-
Mainland	-	✓	-	-	-	-
Expansion of R-6604A/B over Main Base Runways	✓	✓	✓	✓	✓	-
Alternative Location 1	✓	✓	-	✓	-	-
Alternative Location 2	✓	✓	-	-	✓	-
Proposed Location	✓	✓	✓	✓	✓	✓

Legend: ✓ = yes; - = no.

Figure 8. Alternative Locations Considered at WFF

Figure 9. Alternative Locations Considered on the North End of Wallops Island

Expansion of the Existing UAS airstrip on the south end of Wallops Island was considered, but not carried forward as a viable alternative. The north/south orientation of the airstrip makes it susceptible to east/west cross winds; the airstrip is often inundated with water and sand from storm events, and mandatory safety constraints from increased rocket launch activities at the nearby MARS would continue to reduce UAS test/research opportunities. Additionally, expansion of the existing airstrip to a length necessary to accommodate the next class of UAS, the Viking 400, would place the south end unacceptably close to Resource Conservation and Recovery Act (RCRA) permitted hazardous waste Treatment, Storage, and Disposal Facility (TSDF) (refer to Figure 8). This alternative would be incapable of meeting Criterion 3, 4, and 5 and the continuing needs of the UAS scientific and research community (Criterion 1) would be adversely affected. Expansion of the existing airstrip was not considered a viable alternative and is not carried forward for detailed analysis.

Causeway Road (Route 803) links Wallops Island to the Mainland. WFF considered using a section of the road south of the Causeway Bridge since the location, dimensions, and orientation of the road segment would meet the requirements of Criterion 1, 2, 4, and 5; however, the road does not present a flat, level surface required for safe operations. Additionally, UAS operations would require scheduled road closures, up to 3 days in a row in some cases, and extra roadway maintenance to ensure the road was clear of debris. Use of Causeway Road could place limitations and restrictions on other NASA mission areas, in conflict with the requirements under Criterion 3. Furthermore, the proximity of the Mainland's occupied facilities would present an unacceptable risk to people and structures resulting in failure to meet Criterion 6. As such, this alternative location was not considered viable and therefore not carried forward for further analysis.

The Mainland is a thin strip of land adjacent to Wallops Island. The Mainland is the location for WFF's radar, optical, communications, and command transmitter facilities along with the Wallops Geophysical Observatory and the Atmospheric Sciences Research Laboratory. Due to the structures found on the Mainland, operation of a UAS airstrip would conflict with existing mission activities, present unnecessary hazards to persons on the ground, and would require UAS to fly over MARS to remain within R-6604 A/B and avoid populated areas to the north, south, and west of the Mainland. The Mainland would not provide suitable space to construct an airstrip of the required length or orientation; would present an unacceptable risk to persons in the Mainland's occupied facilities; and would therefore fail to meet the needs of the scientific and research community. Only Criterion 2 would be met at this location. As such, the Mainland as an alternative location is not carried forward for detailed analysis.

Expansion of R-6604 over the Main Base runways was considered. In 2009, WFF submitted a proposal to the FAA for expansion of restricted airspace R-6604 to the west to encompass the airspace above NASA's property. The intent of the proposal was to meet the needs of ongoing and future UAS and UAS-based test research at a location void of constraints and limitations such as those presented at the existing UAS airstrip and to ensure that non-participating aircraft would not be granted access while the restricted airspace was active. The expansion would have enveloped the airspace above all three runways of WFF's Research Airport and the entire Main Base area. Expansion of the restricted airspace would have permitted UAS to take off from the Main Base runways, transit to an already established restricted area (i.e., R-6604A/B), and return to the Main Base runways for landing without the need for a COA. Expanding R-6604 over the Main Base would have given WFF the ability to effectively accommodate multiple flight platforms and move the current UAS operations away from the MARS furthering WFF's support of the needs of the scientific community.

Subsequent to NASA's request, FAA rejected the proposal for restricted airspace expansion instead suggesting that WFF apply for a COA for each UAS vehicle configuration. The time required to secure a COA (nominally 60 days) would severely limit the necessary flexibility to test a variety of new UAS.

It is noteworthy that this alternative would not have been the definitive solution, as it would have only rectified the potential for the encroachment of non-participating aircraft during UAS operations. To meet NASA flight safety criteria (to protect persons and property on the ground) for unproven UAS transiting to or from the Main Base airfield, Route 175 would be closed for up 20 to 30 minutes for each takeoff and landing. Closure of Route 175 is undesirable to NASA as this road is the only means of vehicular ingress and egress to Chincoteague, Accomack County's largest town. Additionally, the Main Base runways are adjacent to the NASA and NOAA workforce as well as various high value assets (e.g., NASA telemetry assets and NOAA tracking assets). For UAS missions flown on the Main Base, significant flight restrictions would be required to protect people and property; some UAS would be denied because the risk is too great, even with restrictions. Likewise, several of the approach paths to the runways overfly housing developments, all within 0.8 km (0.5 mi) mile of the end of the respective runway. This places additional restriction on UAS take-off and landing options.

In summary, expansion of R-6604 would not ensure the flexibility necessary to fulfill the requirements under Criterion 1 and would fail to meet the requirements under Criteria 2 and 6. Therefore, this alternative is not carried forward for detailed analysis.

Alternative Location 1 was initially considered for placement of the proposed UAS airstrip. An existing road would provide access to the site, the location would be outside of the munitions and explosives of concern (MEC) hazard area, outside of areas modeled as having an increased sensitivity for potential archaeological resources, and would not encroach upon the bald eagles' nest situated to the northeast. The location of the airstrip would require UAS to operate over active piping plover nesting areas at altitudes near the airstrip of 150 m to 300 m (500 ft to 1,000 ft). The U.S. Fish and Wildlife Service (USFWS) has requested that UAS not operate within 300 m (1,000 ft) horizontally or vertically of sections of the beach on which piping plovers are known to nest during breeding season (USFWS 2003). Construction of an airstrip at Alternative Location 1 would have to cross over a wetland area potentially impacting 1.1 ha (2.75 ac) of wetlands. Additionally, in 2010, WFF identified an area just south of Alternative Location 1 for potential placement of a Rocket Motor Storage Building. The building would contain Class 1.1 explosives; a 380 m (1,250 ft) safety buffer (i.e., hazard arc) would surround the building and encompass the majority of Alternative Location 1 rendering it unusable for UAS operations. Given the placement of the Rocket Motor Storage Facility, Alternative Location 1 would not meet the requirements under Criteria 3, 5, and 6. This alternative was not considered further and is not carried forward for detailed analysis.

Alternative Location 2 was also an initial consideration for placement of the proposed UAS airstrip. An existing road would provide access to the site, the location would be just outside of the MEC hazard area, outside of areas modeled as having an increased sensitivity for potential archaeological resources, it would not encroach upon the bald eagle's nest situated to the northeast, and the airstrip would be oriented southeast-northwest. Construction of an airstrip at Alternative Location 2 would potentially impact 0.5 ha (1.25 ac) of wetlands. As would occur under Alternative Location 1, the location of the airstrip would require UAS to operate over piping plover nesting areas at altitudes near the airstrip of 150 m to 300 m (500 ft to 1,000 ft), encroaching upon the USFWS-requested 305 m (1,000 ft) "no fly" buffer. Additionally, the potential placement of the Rocket Motor Storage Facility south of the site would require a 380 m (1,250 ft) hazard arc around the building. The buffer would surround the building and would encompass the majority of the alternative site rendering it unusable for UAS operations (Criterion 1). Lastly, the airstrip could not have been practically built to the required length as this would require extending it onto the beach and into the Atlantic Ocean, thereby failing Criterion 4. Alternative Location 2 was not considered a viable alternative since it would not meet the requirements under Criteria 3, 4, and 6; this alternative is not carried forward for detailed analysis.

Original Proposal

Based on consideration of the 6 Criteria, WFF determined that the north end of Wallops Island was the preferred location for the UAS airstrip. In 2009, WFF originally proposed to construct a 1,600 m (5,200 ft) long by 25 m (75 ft) wide UAS airstrip on the north end of Wallops Island at the location currently proposed. Construction of the airstrip under the original proposal would have affected approximately 14 ha (34 ac) of wetlands from clearing and fill activities. The southeast end of the airstrip would have encroached within the 200 m (660 ft) buffer around the bald eagle's nest and would have extended into the piping plover nesting area located to the southeast. Additionally, essential fish habitat (EFH) found in the tidal wetlands may have been adversely impacted from clearing and fill activities. After careful consideration of the potential environmental impacts associated with an airstrip of that length in this location, WFF surveyed its UAS user community and determined that a shorter airstrip would satisfy the majority of the UAS missions expected to fly at WFF in the reasonably foreseeable future. As such, the airstrip length originally proposed has been reduced to 900 m (3,000 ft) while the width of the airstrip would remain at 25 m (75 ft).

Alternatives Analyzed in this EA

As shown in Table 3, application of the criteria for defining the location for a new UAS airstrip, indicate that one location would meet the overall purpose and need, would fulfill the requirements under Criteria 1 through 6, and would result in the least amount of potential environmental impacts. This EA analyzes the preferred alternative (Proposed Action) and the No Action alternative. The No Action alternative reflects the *status quo*, in which a new UAS airstrip would not be constructed; use of the existing south Wallops Island UAS airstrip would continue.

2.2 PROPOSED ACTION

Under the Proposed Action, WFF would construct an asphalt airstrip measuring approximately 900 m (3,000 ft long [2,500 ft plus an additional 500 ft clear zone]) on the north end of Wallops Island. The width of the airstrip would be 25 m (75 ft) wide; additional width would be provided by a grass buffer and cleared areas as needed for a clear line of sight for UAS operators. Figure 10 provides a representative view of one section of the proposed airstrip followed by a discussion on the design, construction, maintenance, and operation of the UAS airstrip under the Proposed Action.

The USACE, as a cooperating Federal agency, would undertake a "connected action" (40 CFR 1508.25) that is related to, but unique from WFF's proposed action, the construction and operation of a UAS airstrip. In the pre-construction phase of the project, WFF would be required to submit an application for authorization from USACE because the Proposed Action would result in unavoidable impacts to jurisdictional wetlands. Therefore, USACE's proposed action would be to issue WFF a permit under Section 404 of the CWA for the placement of fill in waters of the U.S. (wetlands). As such, the effects of USACE's proposed action are also considered in this EA.

Design, Construction and Maintenance of the Proposed UAS Airstrip

Design

The UAS airstrip would incorporate typical manned aircraft runway design elements such as the necessary airstrip length, width, shoulders, and clear zone. The length and width of the airstrip would be the minimum required to support the takeoff/landing requirements of the largest UAS proposed (i.e., Viking 400-class) for operations at the airstrip. The unpaved shoulders of the airstrip would provide passage of maintenance or other vehicles and the occasional UAS that may veer off course. The clear zones would extend beyond the end of the airstrip and would provide additional area for takeoff operations. The airstrip would be designed to ensure that the surface area is flat, without humps, depressions, or other surface variations and the shoulders of the airstrip would be sloped to direct water to an infiltration trench.

Consideration of Climate Change

The airstrip would be designed so that the centerline of the asphalt would be at 1.97 m (6.47 ft) above approximate Mean Sea Level. The sea level rise at WFF over the next 50 years is projected to be between 0.25 m (0.84 ft) and 0.78 m (2.53 ft) (USACE 2011). Since the mean tidal range in the vicinity is 1.1m (3.6 ft), and the spring tidal range is 1.3 m (4.4 ft) it is unlikely that the maximum projected sea level rise would threaten the airstrip, even combined with a spring tide (USACE 2011). Storm surges would have the potential to inundate the airstrip, however, and UAS missions would have to be cognizant of this issue when scheduling operations. The expectation is that locating the airstrip on the northern portion of Wallops Island in the lee of Gunboat Point would best protect it from full impacts of the increased

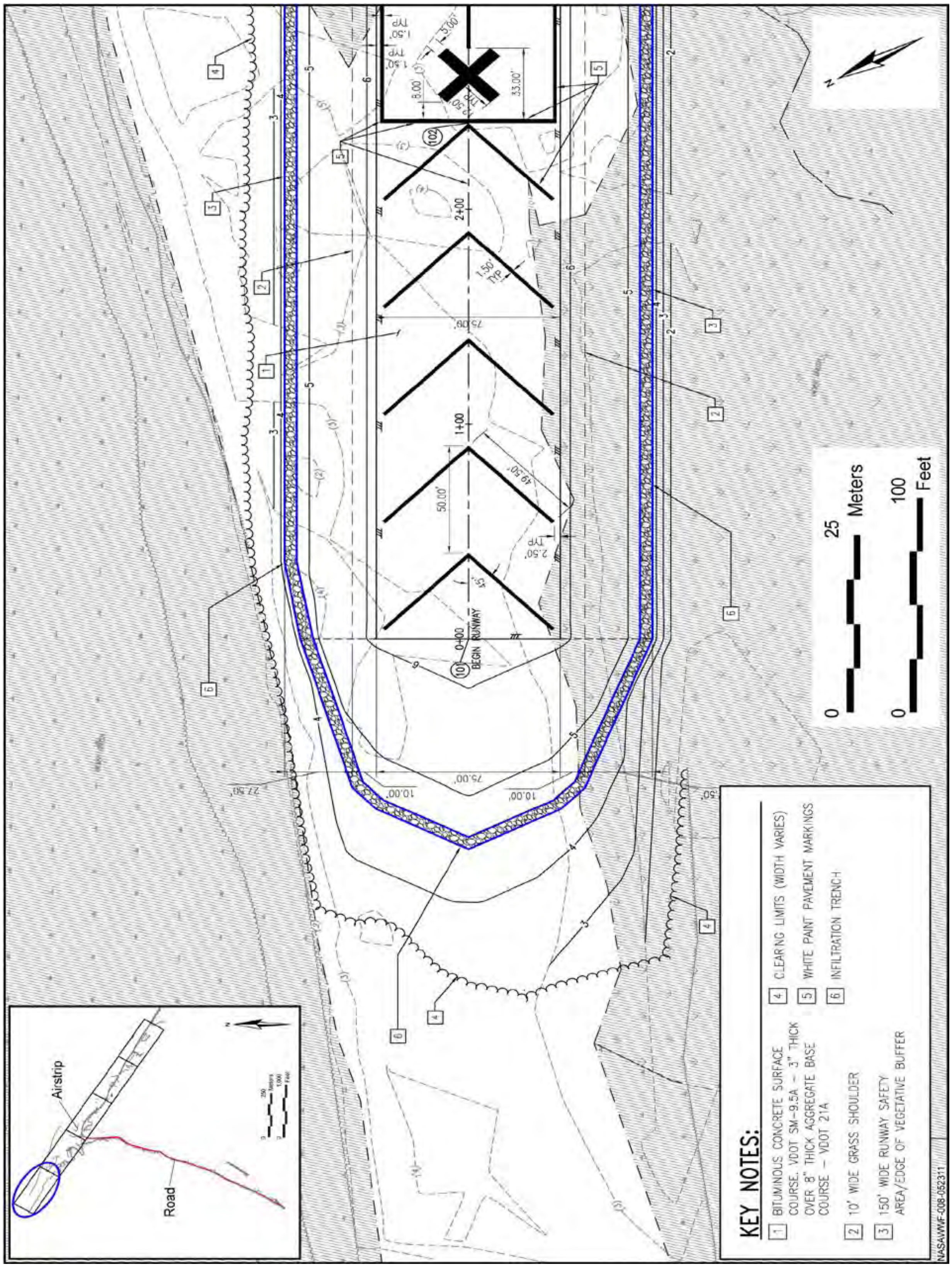

Figure 10. Representative View of Proposed UAS Airstrip

severity of storms (and damaging surf) that would be experienced along the Wallops Island beach, which is the location of the existing UAS airstrip.

Construction

Prior to the start of construction activity, silt fencing and other approved measures to control erosion, sedimentation, and the integrity of a known archaeological site would be put in place. Following these control measures, two structures (a metal observation tower and a wood frame observation platform) located within the project area would be removed. The area comprising the base and clearing limits of the airstrip would be cleared of all vegetation. Vegetation alongside the length (out to 30 m [100 ft] on each side of the centerline) of the airstrip would be cleared (Figures 10 and 11). Trees would be cut to ground level; digging below ground to remove stumps and roots is not anticipated since the area for the airstrip would be elevated with up to 1 m (3 ft) of fill in most areas. The site would then be filled, compacted, and graded to design specifications prior to application of the asphalt.

Construction of the UAS airstrip and associated road improvements would affect approximately 3.26 ha (8.05 ac) of vegetated areas from clearing; clearing would encompass the minimum required for the buildup of the UAS airstrip and that needed to safely conduct UAS operations. Airstrip construction would also fill approximately 1.0 ha (2.47 ac) of non-tidal wetlands. The appropriate permits for construction in a wetland area would be obtained prior to commencement of construction activities.

The UAS airstrip would need to be elevated approximately 1 m (3 ft) above the existing ground surface to ensure sufficient surface water runoff for UAS operations. A Low Impact Development (LID) infiltration trench would be constructed to capture the surface water runoff; the trench would be constructed in accordance with Virginia stormwater management regulations and Virginia Department of Conservation and Recreation (DCR) standards for pre- and post-development stormwater quality and discharge rates. Figure 11 provides a typical pavement section of the proposed airstrip and infiltration trench.

A staging pad for aircraft and support vehicles (i.e., government vehicles, fire truck, mobile command station, and road sweeper) in preparation for and during flight operations would be located just below the point where the access road meets the airstrip. Crushed gravel would be used to improve a portion of the existing dirt access road that provides service to the northernmost end of Wallops Island. An extension leading off of the existing paved road would connect to the existing access road (refer to Figure 9). Infrastructure improvements to provide electrical and telecommunication service would be implemented.

WFF anticipates construction of the UAS airstrip would require approximately 9 to 12 months to complete. Construction activities would occur during daylight hours.

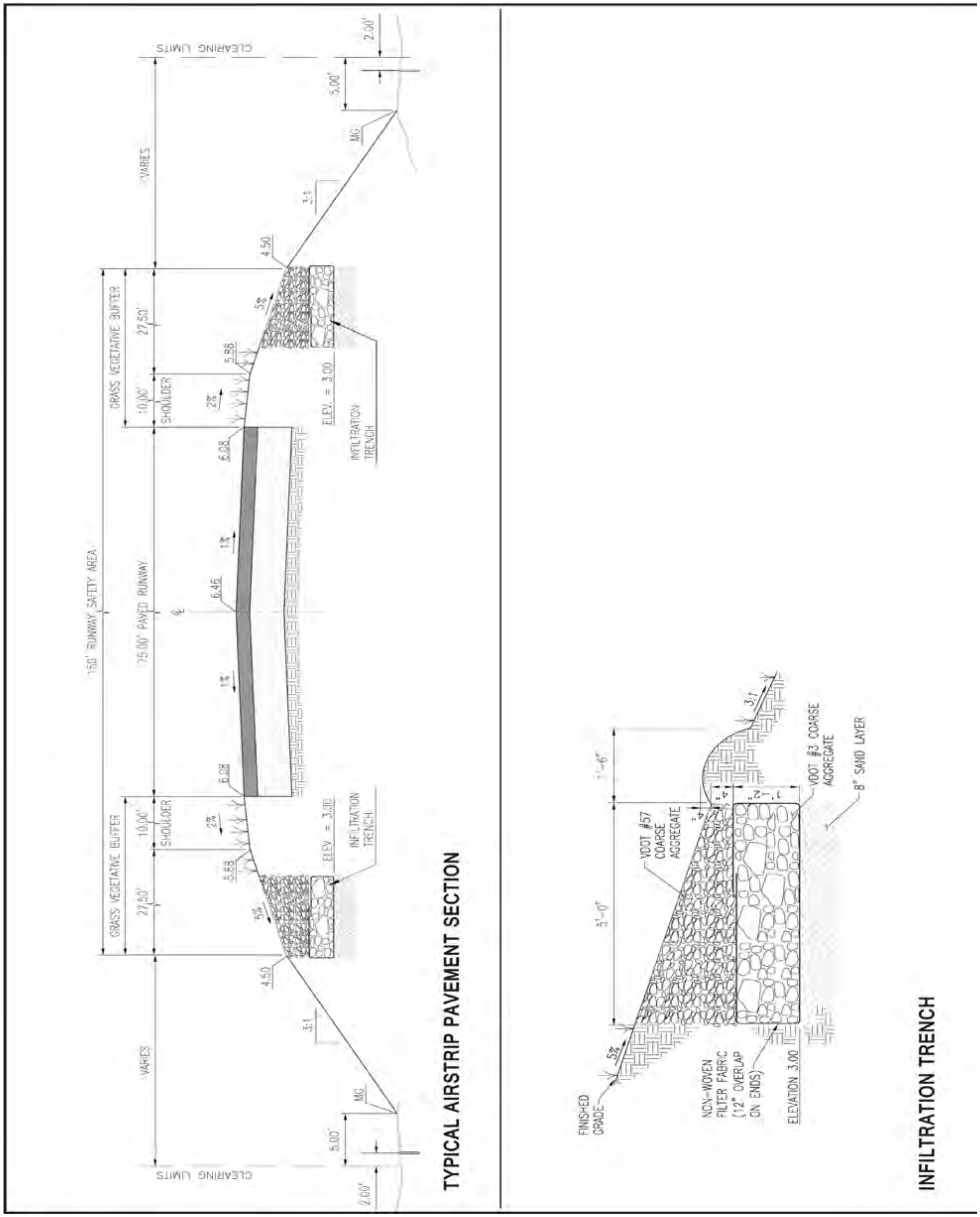

Figure 11. Proposed UAS Airstrip – Typical Pavement Section and Infiltration Trench

Maintenance

UAS operators require a clear line of sight during take-offs and landings; therefore, vegetation alongside the length (out to 30 m [100 ft] on each side with some variations) of the airstrip would be maintained by mowing and via hand clearing with simple mechanical tools, as needed, throughout the year. Beyond the ends of the airstrip, the vegetation height would also be maintained in order to provide the necessary line of sight for UAS operators. Clearing around the known archaeological site would be performed in accordance with a plan approved January, 2011, by the Virginia Department of Historic Resources (VDHR).

Operations at the New UAS Airstrip

Typical UAS-based operations would be conducted year round during WFF's normal ATC tower hours (Monday through Friday, 0600 to 1800). From 2007 to 2009, annual UAS operations varied between 70 and 130 sorties[2] (personal communication, Justis 2010a). Under this proposal, WFF proposes to conduct on average, four UAS sorties each day. A maximum of 1,040 UAS sortie operations[3] would occur each year. This total would include the transition of UAS flight operations from the south Wallops Island airstrip. The number and frequency of operations would be dictated by the type of UAS test and UAS-based research being conducted in a given year.

Night operations would be probable but infrequent, taking place under special circumstances (e.g., hurricane monitoring). The airstrip would have no permanent lighting; should lighting be required for the rare nighttime operation, the lighting would be provided via mobile vehicle source at the minimum intensity necessary for task performance.

UAS Proposed for Operations

A representative list of UAS that would operate from the north Wallops Island airstrip is provided in Table 1. The Viking 400- class of vehicle would be the largest UAS authorized that would be operated from the proposed airstrip. The Viking 400 has a 6 m (20 ft) wingspan, is 4.5 m (14.7 ft) in length, and would have a maximum weight of 240 kg (530 lbs). The maximum length for takeoff and landing the Viking 400, including safety margins, is 760 m (2,500 ft).

UAS operators are and would remain responsible for transporting their respective aircraft to and from WFF; operators are not provided storage or maintenance space while on the installation. On average, a UAS operations team would consist of three people who would remain in the local area for up to two weeks. Additionally, WFF range safety personnel, consisting of up to three persons would remain on site during UAS operations. If the UAS would be used as a base for NASA scientific instrumentation, up to two NASA science personnel would also be present to monitor the instrument's functionality.

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[2] A sortie consists of a single UAS flight operation from takeoff through landing.
[3] A sortie operation applies to flight activities outside of the airfield/airstrip space environment.

UAS would be controlled by the operator via a truck mounted mobile command center or a hand-held control switch, depending on the type of UAS being operated. Operators would be required to maintain a clear line of sight for UAS take-offs and landings. WFF would not permit UAS to be remotely controlled unless prior approval by WFF Range Safety Office was provided. With the exception of the Aerosonde listed above, UAS operating from the airstrip would be fueled with a common jet propellant (JP). JP-5 is the most frequently used fuel for turbine engines. This fuel would not be stored on site; each UAS operator would be responsible for transporting and dispensing fuel for each day's use. The average UAS operating from WFF would hold approximately 11 liters (3 gallons) of JP-5 fuel.

2.3 NO ACTION ALTERNATIVE

CEQ regulations (40 CFR Part 1502.14(d)) for implementing NEPA require analysis of a No Action alternative. "No Action" means that implementing the Proposed Action would not occur. The resulting environmental effects from taking No Action would be compared to the effects of implementing the Proposed Action. Under the No Action alternative, WFF would not construct or operate a UAS airstrip on north Wallops Island. This alternative would reduce UAS testing and UAS-based research opportunities at WFF. UAS would continue to operate from the south Wallops Island airstrip; however, limitations on operations currently experienced (as described in Section 1.3.2) would remain.

2.4 ENVELOPE CONCEPT

This EA evaluates the effects of construction and operation of a larger UAS airstrip on the north end of Wallops Island. As several different UAS would be expected to fly from the proposed airstrip in the future, the largest UAS and payload, in terms of potential environmental impact, were chosen as the demonstration, or "envelope," to provide a benchmark for assessing impacts on environmental resource areas.

Under the envelope concept, existing and future UAS possessing similar qualities as the "envelope" would be expected to have less than or equal impacts. For example, if noise from the envelope UAS has an insignificant impact on a resource, a quieter operating UAS would fall within the same range of impacts and also have an insignificant impact.

The envelope UAS for noise is the Viking 300. The manufacturer (L-3) has stated that the noise from an operating Viking 300 is approximately 70 decibels (dB) at an altitude of 300 m (1,000 ft). The Viking 400, while larger, would operate more quietly than the Viking 300 due to a design change that includes the installation of a muffler system. The Viking 300 is then the envelope against which future UAS would be compared for noise affects to sensitive receptors. The Viking 400 would be the largest UAS (in terms of physical size and quantities of onboard materials) that would operate from the new airstrip, and would be the envelope against which future UAS would be compared for other impacts (e.g., hazardous materials).

Existing and future UAS not specifically mentioned in this EA would be considered within the scope of this document if analysis determines that their impacts do not exceed those associated with the envelope UAS. The subsequent analysis and final determination would be documented in a Memorandum to be kept in the official project files. If the analysis finds that the impacts are outside the scope of this EA, further NEPA documentation may be prepared.

2.5 NATIONAL ENVIRONMENTAL POLICY ACT GUIDANCE

This WFF UAS Airstrip EA was prepared in accordance with the requirements of NEPA of 1969; the CEQ regulations implementing NEPA (40 CFR 1500-1508); and NASA Procedural Requirements 8580.1 *Implementing the National Environmental Policy Act and EO 12114* as promulgated in 14 CFR § 1216 Subpart 1216.3. The steps involved in the environmental analysis process used to prepare this EA are outlined below.

1. **Conduct Scoping –** On July 14, 2010, coordination letters were sent to federal, state, and regional government agencies. Comments were requested on WFF's proposal to construct and operate a UAS airstrip on the north end of Wallops Island. Chapter 7 provides the list of agencies and organizations to which the coordination letters were sent; Appendix A provides a sample of the 2010 coordination letter and the responses received. Included in Appendix A is the 2009 coordination letter and responses received on the original proposal. The primary issues that emanated from the scoping process include concerns for biological resources (i.e., bald eagles, peregrine falcons, piping plovers, sea turtles, wetlands, and rare plants and communities), cultural resources (1952 North Observation Mound and archaeological Site 44AC0089), potential limitations on Navy radar operations, and cumulative impacts from previous and planned WFF activities. A public information meeting was held at the WFF Visitor Center August 2, 2010; a total of six people attended the meeting. One written comment in support of the project was received and one other person asked if there would be land or water closures associated with the airstrip proposal.
2. **Prepare a draft EA –** The first comprehensive document for public and agency review is the draft EA. The EA examines the environmental impacts of the Proposed Action and No Action alternative.
3. **Announce that the draft EA has been prepared –** An advertisement will be placed in two newspapers local to WFF – the Chincoteague Beacon and the Eastern Shore News. The advertisement will notify the public as to the availability of the draft EA for review in local libraries and on the World Wide Web (*http://sites.wff.nasa.gov/code250/UAS_DEA.htm*). The draft EA will be made available at the following libraries: Island Library, Chincoteague, Virginia; and Eastern Shore Public Library, Accomac, Virginia.
4. **Provide a public comment period –** A 30-day period for public review of the draft EA will be initiated. This provides the public and agencies the opportunity to provide comments concerning the findings presented.
5. **Prepare a final EA –** Following the public comment period, a final EA is prepared. This document is a revision (if necessary) of the draft EA, includes consideration of public and agency comments, and provides the decision-maker with a comprehensive review of the Proposed Action and the potential environmental impacts. The final EA will be made available

at the following libraries: Island Library, Chincoteague, Virginia; and Eastern Shore Public Library, Accomac, Virginia. The final EA will also be made available on the World Wide Web at: (*http://sites.wff.nasa.gov/code250/UAS_FEA.htm*).

6. **Issue a Finding of No Significant Impact (FONSI) or Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) –** The final step in the process is either a signed FONSI if the analysis supports this conclusion, or a determination that an EIS would be required for the proposal. Advertisement of the signed FONSI (as well as availability of the final EA) would be published in the Chincoteague Beacon and the Eastern Shore News. If a determination to prepare an EIS is made, a NOI would be published in the *Federal Register*.

Related NEPA Activities

In January 2005, NASA published a Final Site-wide EA and FONSI for its existing and reasonably foreseeable activities at WFF. However, since 2005, WFF has experienced mission growth and is actively undertaking efforts to identify future opportunities. To that end, NASA determined that its planning process would be most efficiently accomplished with the preparation of another master planning-type NEPA document. On July 11, 2011, NASA published a NOI to prepare a WFF Site-wide Programmatic EIS (PEIS) in the *Federal Register* (76 FR 40751). The Site-wide PEIS will allow the early identification of broad issues needing consideration prior to the implementation of specific proposed projects.

The letter from the Virginia congressional delegation referenced in Section 1.2 requested that WFF include a UAS test range in its environmental planning, suggesting that the consideration of the test range be included in the Site-Wide PEIS. However, to meet the expected timeline established by the pending legislation for use of the north Wallops Island UAS airstrip, and to ensure continuity of operations in light of likely storm damage and mission conflicts, NASA needs to have the ability to begin work on the project in advance of rendering a Record of Decision (ROD) for the Final Site-wide PEIS, which is anticipated in mid-2013. Moreover, the programmatic nature of the Site-wide PEIS will not allow for the level of specificity necessary to facilitate an informed decision regarding the airstrip; a project-specific document would. Therefore, NASA prepared this separate, project-specific EA to analyze the potential impacts of the north Wallops Island UAS airstrip in advance of its completing the Site-wide PEIS. This EA (or EIS, if required) will be incorporated by reference and included in the Site-wide PEIS cumulative effects analysis. Likewise, any activities scoped for inclusion in the Site-wide PEIS that are within the geographic boundaries of the cumulative effects analyses for this EA are fully considered in Section 5.3.

2.6 SUMMARY OF POTENTIAL ENVIRONMENTAL IMPACTS

The potential environmental impacts from implementation of the Proposed Action and No Action alternative are summarized in Table 4 below.

Table 4. Summary of Potential Environmental Impacts

Resource	*Proposed Action*	*No Action Alternative*
Airspace Management	Minor, long-term impacts to airspace management could occur with an increase in UAS operations. UAS operations would continue to occur in R-6604A/B and Warning Area (W-) 386. Conditions under which civilian pilots and general aviators need to request permission to enter R-6604A/B or W-386 when the airspace is active, would remain unchanged.	No change to existing conditions; UAS operations would remain at present levels and continue to occur in R-6604A/B and W-386.
Safety	UAS operations present potential ground or flight safety risks; however, with an excellent safety record and pre-flight and flight procedures that would continue to be followed, the potential for adverse ground or flight safety impacts would be very minor.	No impact would be anticipated; ground and flight safety procedures would continue to be observed.
Noise	Minor, short-term impacts to the noise environment during construction activities. The noise environment under the flight track near the airstrip could generate noise of approximately 83 dB representing a minor, long-term impact; noise in the operating airspace would not be expected to exceed 43 dB Day-Night Average Sound Level (DNL).	No impacts would occur under the No Action under which the existing noise conditions at the north end of Wallops Island would remain unchanged.
Biological Resources	Minor, short-term and long-term impacts to biological resources would be anticipated under the Proposed Action. The introduction of new noise from airstrip construction and UAS overflight operations would be anticipated to startle wildlife; however, measures (i.e., minimum overflight of beach and avoidance of a bald eagle nest) would reduce these impacts. Minor, long-term impacts to upland and non-tidal wetland communities would occur. Approximately 3.26 ha (8.05 ac) of vegetation would be cleared and roughly 1.0 ha (2.47 ac) of non-tidal wetlands would be filled. The loss of habitat would not adversely impact wildlife species abundance or population sustainability. Minor, short-term impacts to federal threatened, endangered, or candidate species (loggerhead sea turtle, piping plover, and red knot) from overflight noise or nighttime lighting (if applicable) could occur; however, each of the species would be monitored and UAS operations mitigated if it was determined necessary. Construction would remove approximately 0.93 ha (2.3 ac) of maritime dune woodland; this ecosystem is considered rare by the Commonwealth of Virginia; however this impact would be minor when considered with the context of existing like habitat in the Mid-Atlantic region. Minor indirect impact to EFH.	Short- and long-term impacts to biological resources would remain unchanged with implementation of the No Action alternative.
Topography and Soils	Localized and very minor impacts to the topography from grading and fill activities. Spill or leaks from construction vehicles and later from UAS refueling or personnel vehicles could adversely affect soils; site-specific Best Management Practices (BMPs) addressing spill prevention and control measures would be implemented.	BMPs addressing spill prevention and control measures would continue to be implemented at the existing UAS airstrip.

Table 4. Summary of Potential Environmental Impacts (con't)		
Resource	***Proposed Action***	***No Action Alternative***
Water Resources	All activities occur with Virginia's Coastal Zone Management (CZM) area. WFF has determined that the Proposed Action is consistent with the enforceable polices of the Coastal Zone Management Program. Functionality of the floodplain would not be affected. Minor, long-term impacts to wetlands would occur as up 1.0 ha (2.47 ac) of non-tidal wetlands would be filled. WFF would obtain the necessary permits to secure authorization for these impacts and to identify appropriate compensation mitigation measures. NASA would ensure that its actions comply with EO 11988, *Floodplain Management*, and 14 CFR 1216.2 (NASA Regulations on Floodplain and Wetland Management) to the maximum extent possible.	No impact to water resources from implementation of the No Action alternative would be anticipated.
Cultural and Traditional	No impact to Site 44AC0089 (Revolutionary War earthwork) with implementation of avoidance and mitigation measures approved by the VDHR. No impacts to architectural resources or traditional cultural properties.	No impacts to cultural or traditional cultural resources would occur under the No Action alternative.
Land Use, Visual and Recreation	No adverse impact to land use under the current designation. Minor adverse impacts to visual resources would occur with the change in the viewshed; however, natural vegetation along the beach from and tidal wetlands would shield much of the airstrip from view. No impact to recreation.	The existing land use classification would remain unchanged. The viewshed would not be changed; the lack of recreational areas on the island would continue.
Air Quality	Negligible impacts to air quality from construction and operational activities; annual emissions would not exceed 227 tonnes (250 tons) per year for any criteria pollutant. Greenhouse gas emissions would remain far below 25,000 tonnes (27,500 tons) per year.	Impacts to air quality from existing UAS operations would remain unchanged.
Hazardous Materials, Hazardous Systems and Hazardous Waste Management	The potential for minor adverse impacts exists due to the use of hazardous materials during construction and UAS flight; however, the impacts would be localized and measures to ensure the safety of people and the environment would be implemented. WFF and USACE would provide personnel with education and oversight on the proper procedures to follow should MECs be discovered during the clearing and construction at the site.	No change in the measures to protect human health and the environment would occur under the No Action alternative.
Socioeconomic	Minor, short-term positive impacts to the local economy during the construction phase. Minor long-term positive impacts to the local economy would occur each year from the purchase of food, supplies, and lodging by research scientists and students conducting UAS operations at WFF.	No change to impacts provided to the local economy from existing UAS operations.
Transportation	Minor, short-term adverse impacts to the local area roads from construction traffic would be anticipated. Vehicular traffic from UAS operations would be expected to increase under the Proposed Action; however, the impact to transportation resources would be negligible.	Vehicular traffic would remain at present levels under the No Action alternative.
Cumulative Effects	Minor cumulative impacts due to loss of upland vegetation and non-tidal wetlands. Mitigation would be provided to compensate for all wetland losses.	No cumulative impacts under continued use of the existing UAS airstrip.

CHAPTER 3

DESCRIPTION OF THE AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

CHAPTER 3
DESCRIPTION OF THE AFFECTED ENVIRONMENT AND CONSEQUENCES

3.1 ANALYSIS APPROACH

NEPA requires focused analysis of the areas and resources potentially affected by an action or alternative. It also provides that an EA should consider, but not analyze in detail, those areas or resources not potentially affected by the proposal. In other words, an EA should not be encyclopedic; rather, it should be succinct. NEPA also requires a comparative analysis that allows decision makers and the public to differentiate among the alternatives. Therefore, this EA focuses on those resources that would be affected by UAS operations conducted from the north end of Wallops Island.

CEQ regulations (40 CFR §§ 1500-1508) for NEPA also require an EA to discuss impacts in proportion to their significance and present only enough discussion of other than significant issues to show why more study is not warranted. The analysis in this EA considers the existing conditions of the affected environment and compares those to conditions that might occur should WFF implement the Proposed Action or No Action alternative.

Affected Environment

The affected environment for this UAS Airstrip EA includes the north end of Wallops Island where the airstrip would be constructed, and R-6604A/B and the Virginia Capes (VACAPES) Operating Area (OPAREA) (i.e., W-386) where UAS flight operations would continue to occur.

Resources to Be Analyzed

Table 5 presents the results of the process of identifying resources to be analyzed in detail in this EA. This assessment evaluates airspace management; safety; noise; biological resources; topography and soils; water resources; cultural and traditional resources; land use, visual, and recreation resources; air quality; hazardous materials, hazardous systems, and hazardous waste management; socioeconomics; and transportation. These resources are analyzed in detail in Sections 3.2 through 3.13 because they may be potentially affected by implementation of the Proposed Action.

Resources Not Carried Forward for Detailed Analysis

Potential impacts to environmental justice and protection of children were assessed; impacts to these resources would be negligible and do not warrant detailed analysis. The following provides the rationale for this approach.

Table 5. Resources Considered in this UAS Airstrip EA		
Resource	***Potentially Affected by UAS Activities***	***Analyzed in Detail in this EA***
Airspace Management	Yes	Yes
Safety	Yes	Yes
Noise	Yes	Yes
Biological Resources	Yes	Yes
Topography and Soils	Yes	Yes
Water Resources	Yes	Yes
Cultural and Traditional Resources	Yes	Yes
Land Use, Visual, and Recreation Resources	Yes	Yes
Air Quality	Yes	Yes
Hazardous Materials, Hazardous Systems, and Hazardous Waste Management	Yes	Yes
Socioeconomics	Yes	Yes
Transportation	Yes	Yes
Environmental Justice and Protection of Children	No	No

Environmental Justice and Protection of Children

In 1994, E O 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, was issued to focus attention of federal agencies on human health and environmental conditions in minority and low-income communities and to ensure that disproportionately high and adverse human health or environmental effects on these communities are identified and addressed. In 1997, EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks (Protection of Children)*, was issued to ensure the protection of children. Environmental justice addresses the disproportionate effect of a federal action on low-income or minority populations. If implementation of the Proposed Action were to have the potential to significantly affect people, those effects would have to be evaluated for how they adversely or disproportionately affect low-income or minority communities. No aspect of WFF's UAS airstrip proposal would result in a disproportionate impact to the human health or environmental conditions in minority or low-income communities, because none of these communities reside within the affected environment for the Proposed Action. Neither the Proposed Action or No Action alternative would result in an adverse impact to the health and safety of children; therefore, further analysis of this resource is not warranted for this EA.

Resources Carried Forward for Detailed Analysis

Twelve resources are carried forward for detailed analysis as presented in Table 5.

3.2 AIRSPACE MANAGEMENT

The safe, orderly, and compatible use of the nation's airspace is made possible through a system of flight rules and regulations, airspace management actions, and ATC procedures just as the use of the nation's highway system is governed by traffic laws and rules for operating vehicles. The NAS is designed and managed to protect aircraft operations around most airports and along air traffic routes connecting these airports, as well as within special areas where activities such as military flight testing and training are conducted. The FAA has the overall responsibility for managing the NAS and accomplishes this through close coordination with state aviation and airport planners, military airspace managers, and other entities. The FAA assigns responsibility for units of airspace to Air Route Traffic Control Centers (ARTCCs); WFF is located within the Washington ARTCC (Air Nav 2010).

3.2.1 Affected Environment

This section describes restricted area airspace R-6604A/B, the types of operations that are conducted within R-6604A/B, and within the offshore warning areas in which UAS may operate.

Airspace Management

Within the NAS are certain categories of special use airspace called restricted areas and warning areas. Restricted areas separate potentially hazardous military activities, such as air-to-ground training, from other aviation activities. General aviation or civilian aircraft must have permission from air traffic control to enter a restricted area when it is active or "hot." A warning area is airspace of defined dimensions, extending from three nautical miles outward from the coast of the U.S. that contains activity that may be hazardous to nonparticipating aircraft. R-6604A/B is NASA-controlled/restricted airspace that overlies all of Wallops Island, the majority of the Mainland, and a portion of the Main Base runways (refer to Figure 2). R-6604A/B also connects to offshore W-386. R-6604A/B is available 24 hours a day, 7 days a week from the surface to unlimited altitude, while W-386 is from the surface to unlimited altitude with hours of use being intermittent. Notices-to-Airmen (NOTAM) are issued when these areas are activated. When not in use, R-6604A/B and W-386 are "cold" and the airspace is returned to the NAS.

The northwestern portion of R-6604A/B presents some ambiguity since this portion overlies, approximately, the southeast portion of the WFF airport air traffic area. Normally the WFF control tower is the focal point of control for all air traffic transiting that portion of R-6604A/B extending into the airport air traffic area. However, the point of control for this northwest portion is relinquished to the WFF Range Test Director by the control tower operator on certain occasions when test range operations dictate a need. Non-participating aircraft must contact the WFF Range Control Center or the Washington ARTCC to obtain clearance to transit through any portion of the restricted area.

The Navy Fleet Area Control and Surveillance Facility (FACSFAC) VACAPES controls the offshore warning areas, including W-386. As a designated ATC facility, FACSFAC VACAPES is responsible for all aircraft (general, military, and commercial) operating within its area of responsibility, the scheduling of offshore warning areas and operating areas, and the preparation of NOTAMs and Notice-to-Mariners (NOTMARs) for broadcast by the FAA and U.S. Coast Guard, respectively. FACSFAC VACAPES also coordinates ATC and flight monitoring.

UAS Operations

The majority of UAS operations at WFF consist of experimental or first flight aircraft. Some UAS (e.g., Global Hawk) have been proven reliable and are flown from the Main Base under a COA; however, the vast majority of UAS operating at WFF are flown from the UAS airstrip on south Wallops Island. R-6604A/B and W-386 support flight activities that could be hazardous to non-participating aircraft. First flight and experimental UAS operating from WFF do not operate over Chincoteague Island, Assateague Island National Park, or over any populated areas.

3.2.2 Environmental Consequences

Proposed Action

Under the Proposed Action, UAS would continue to operate in R-6604A/B and W-386. No changes would be required to R6604A/B or W-386 to permit continued UAS operations. Use of other VACAPES warning areas is possible, depending on mission requirements, but would be infrequent (personal communication, Dickerson 2010). Typically, UAS operations would be conducted year round during WFF’s normal control tower hours (Monday through Friday, 7 AM to 5 PM) with occasional night and weekend operations. A maximum of 20 UAS operations would be conducted each week (i.e., 5 days each week; 4 operations a day) for a maximum of 1,040 UAS operations each year from the proposed new airstrip. Civil aircraft operations within the WFF region would not be measurably affected by UAS operations at the new airstrip or within testing airspace due to restricted airspace and warning area separation rules. Given that UAS activity would increase at WFF, the restricted airspace would be activated more frequently, thereby diverting non-participating aircraft either above or around the “no-fly zones.” Conditions under which general aviators or civilian pilots would need to request permission to enter R-6604A/B or W-386 when active would remain unchanged. Flight monitoring and ATC responsibilities at WFF Range Control Center, Washington ARTCC, and FACSFAC VACAPES would continue. NOTAMs and NOTMARs for broadcast by the FAA and U.S. Coast Guard, when needed for UAS operations in R-6604A/B and W-386, would also remain unchanged.

No Action Alternative

Implementation of the No Action alternative would have no effect on the NASA-controlled/restricted airspace R-6604A/B or W-386. UAS operations would remain at present levels and would operate within R-6604A/B and W-386. Conditions under which general aviators or civilian pilots would need to request permission to enter R-6604A/B or W-386 when active would also remain unchanged.

3.3 SAFETY

The WFF Safety Office plans, develops, and provides policies and procedures to ensure that risks are controlled and minimized during ground and flight operations. A UAS safety certification process is performed prior to ground and/or flight operations to ensure that the mission would be compliant with applicable NASA safety regulations and WFF NASA Procedural Requirement (NPR) 8715.5, *Range Flight Safety Program*, and Range Safety Manual (RSM)-2002, *Range Safety Manual for Goddard Space Flight Center/Wallops Flight Facility* (NASA 2008b). The WFF Aircraft Office is responsible for UAS certification.

The following are key steps in the UAS safety certification process.

- **UAS Operations Standards –** The intention of WFF is to establish operations standards for UAS so they can be routinely operated on the Research Range with minimal oversight and mission participation by the Safety Office. UAS are classified in three ways: 1) those that have successfully operated at WFF; 2) those that have proven airworthiness elsewhere; and 3) those that have never flown before. Systems that have already been operated at WFF generally receive the most rapid project acceptance and flight approval, as this coordination process has already been previously approved. Extensive changes to the system would invalidate the prior approval. Those systems that have operated elsewhere generally require review by WFF officials of documented activities, performance, and design characteristics prior to flight approval. UAS that have never flown before would generally require WFF officials to review the design characteristics and performance predictions prior to flight approval. All flight approvals are subject to standard safety certification evaluations.

- **Safety Risk Analysis –** Prior to flight approval, the UAS operator must provide sufficient background information on the specific UAS so that WFF safety and range management personnel can ascertain a technical and operational understanding of the UAS. This information is used as a starting point for determining any potential hazards and to review existing safeguards. From the information provided the Safety Office provides a Safety Risk Analysis that defines the operations, restrictions, and precautions that must be observed during a UAS mission at WFF. This ensures that UAS risks during ground and flight operations are identified, eliminated, or at least mitigated to the lowest practical level to prevent harm. The Safety Risk Analysis consists of four key elements:
    - ***Range Safety System –*** A range safety system is required for all UAS operating in WFF airspace unless the UAS range is less than all protected areas or the kinetic energy does not exceed 0.2 kilogram force-meters (38 foot-pounds). In small UAS, a loss-of-signal fail-safe that triggers the fail-safe mode in the onboard receiver and activates the preset functions that force descent may be used. Verification that the predetermined range safety system or fail-safe are functioning prior to take-off completes this verification process.
    - ***Radio Control System –*** The radio control system (i.e., antenna and receiver) must meet specific requirements to ensure avoidance of any potential interference. Details for locating, constructing, and shielding antennas and receivers on UAS are described in the *Wallops Flight Facility Uninhabited Aerial Vehicle User's Handbook*, 840-HDBK-0002 (NASA 2005a).
    - ***Airworthiness –*** The first flight of any UAS would be a test flight to determine airworthiness. A configuration document would be maintained describing the flight test, airworthiness, and aircraft configuration. Only experienced, essential personnel would be in the area during the test flight. The WFF Aircraft Office is responsible for issuing the airworthiness certification to the UAS user for operations at WFF.
    - ***System Hazards –*** Also assessed by the Safety Office are any potential hazards that are associated with the UAS, which could include mechanical systems, vehicle/payload and ground based transmitters, hazardous chemicals and chemical systems, noise hazards, gas

turbine hazards, or any other hazardous system or material that may be utilized by the UAS.

- **UAS Operations Crew –** Overall safety of operations is entirely dependent on the personnel operating and maintaining the UAS and equipment. Personnel must be sufficiently skilled and proficient in their tasks and procedures must be comprehensive and unambiguous. Since crew roles may vary for different UAS, WFF does not require specific crew configurations and responsibilities. WFF is; however, open to reviewing the UAS operator’s approach to defining roles and responsibilities to ensure any safety concerns are satisfied.
- UAS design and test features must meet the standards as specified in the Range Commanders Council Standard 323, *Range Safety Criteria for Unmanned Aerial Vehicles,* or a tailored set of equivalent requirements to meet specific hazard analysis requirements (NASA 2008b).

3.3.1 Affected Environment

The affected environment for safety considers the requirement of a UAS airstrip and ground and flight safety requirements of the operational airstrip. Ground safety considers activities associated with UAS pre- and post-flight hazardous operations while flight safety considers the takeoff, in-flight, and landing activities of UAS aircraft within the UAS operating environment.

Ground Safety

To insure that risks are controlled and minimized, day-to-day operations and maintenance activities conducted at WFF are performed in accordance with applicable NASA safety regulations; NPR 8715.5, Range Safety Program; and RSM-2002, *Range Safety Manual for Goddard Space Flight Center/Wallops Flight Facility* (NASA 2008b). The ground safety goal of WFF is to minimize the risks to personnel and property involved in conducting ground operations at the facility and to prevent mishaps. A Ground Safety Plan is prepared for each UAS operation (NASA 2008c).

There are two fire stations at WFF, one on the Main Base and one on Wallops Island, each are manned 24 hours a day by fully trained firefighters and emergency medical technicians. The stations support all normal aircraft activities and generally provide support to include hazardous materials, water supply, rescue, and emergency medical service operations to WFF. The Emergency Operations Center is manned at all times and serves as the communications and alarm center for all WFF emergency services (NASA 2005a). Additionally, a fully equipped first aid and emergency treatment facility is located in Building F-160. A nurse and a physician are on duty during normal working hours (8:00 a.m. to 4:30 p.m.).

Flight Safety

Flight safety is generally associated with the containment of vehicle flight within approved operational areas and vehicle impacts within planned impact areas. The goal of flight safety is to protect the public, range participants, and property from the risk created by conducting potentially hazardous flight operations (e.g., UAS operations) at WFF and to prevent mishaps. Since the variables (vehicle aerodynamic and ballistic capabilities, azimuth and elevation angles, wind effects, air and sea traffic, and proposed impact areas) are unique, a flight safety analysis would be performed for each mission. Vehicle design, reliability, performance, and error predictions for each flight case are reviewed by the Safety Office personnel to assess the safety of the operational vehicle. Flight safety data are prepared by the WFF Flight Safety Group prior to any flight operations where WFF has flight safety responsibilities. This data is published in a Flight Safety Plan and describes the proposed vehicle flight and the means safely contain the flight.

All mission activities are planned such that the risk (probability of hazard to the public) does not exceed $100x10^{-6}$, the maximum acceptable risk level. For those missions where the risk cannot be mitigated below acceptable levels, the risk is analyzed and variances are approved or disapproved according to 803-PG-8715.1.2, *Range Safety Deviation & Waiver Process*. In all cases, the risk is minimized as low as reasonably practical. The range safety analysis establishes hazard areas that could be used in the event that control of a UAS could not be maintained. WFF coordinates its operations with the FAA, the U. S. Coast Guard, and other organizations, as required, to clear potential hazard areas (NASA 2008b).

The unique aspect of UAS flying operations is that the vehicle is unmanned. An external pilot flies the UAS via a data-link from a ground control station, or it is controlled by an internal computer. In flight, if malfunctions occur and the data-link (either communication or global positioning system) is lost, the UAS is programmed to return to a predetermined area within R-6604A/B. Then, it circles while attempts are made to restore the data-link. If all fails, the aircraft simply circles until fuel exhaustion and falls into the water. The circular pattern flown within R-6604A/B ensures that there is little or no risk to persons on the ground (personal communication, Justis 2010b).

UAS flight operations at WFF have an excellent safety/reliability record. A total of 312 UAS operations in the past 3 years have resulted in no crashes or injury to personnel. One hard landing resulted in an Aerosonde vehicle skidding off the airstrip and into a ditch. Four intrusions of aircraft flying into the UAS operations area (R-6604A/B) have been recorded. As a result, UAS must now be equipped with radar tracking systems to prevent interference and potential impact with other WFF test vehicles (personal communication, Justis 2010b).

3.3.2 Environmental Consequences

Impacts would be considered significant if UAS flight operations or associated activities posed a substantial present or potential hazard to personnel or the general public.

Proposed Action

Safety procedures currently in place for UAS operations would continue to be followed. WFF would continue to adhere to procedures to protect the public and staff; therefore, the potential risk from implementation of the Proposed Action would be negligible. UAS flight operations are arranged so that if an incident were to occur, it would cause the least possible injury to personnel and damage to facilities or surrounding property. Only mission essential personnel would be permitted on the UAS airstrip during ground and flight operations.

UAS flown from Wallops Island are not authorized to operate over Chincoteague Island, Assateague Island National Park, or over populated areas if the risk is too high. Although risks from UAS flight operations can never be completely eliminated, WFF carefully plans each UAS flight operation to minimize the risks involved while enhancing the probability for attaining the mission objectives. The Safety Office develops a flight safety plan and flight safety risk analysis that defines the operations, restrictions, and precautions to be observed during UAS operations at Wallops prior to each UAS flight (NASA 2008c). This analysis ensures that UAS risks during flight operations are identified and eliminated, or at least mitigated to the lowest practical level. Avoidance of population centers would continue to ensure the safety of the general public and protection of property.

UAS equipped with the WFF mandated radar tracking system would conform to the radio frequency utilization and applicable procedures for UAS as specified in the *Wallops Flight Facility Frequency Utilization Management Handbook*, would continue to be observed (NASA 2008d).

No Action Alternative

Implementation of the No Action alternative would not affect ground or flight safety in regards to UAS operations beyond baseline conditions. UAS would continue to fly from the south Wallops Island airstrip. Safety procedures currently in place for operating UAS at WFF would remain unchanged.

3.4 NOISE

Sound, expressed in decibels (dB), is created by vibrations travelling through a medium such as air. Noise is often defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, diminishes the quality of the environment, or is otherwise annoying. Response to noise varies by the type and characteristics of the noise source, distance between source and receptor, receptor sensitivity, and time of day. Noise may be intermittent or continuous, steady or impulsive, and may be generated by stationary or mobile sources. There are two noise sources discussed in this EA. The first is noise generated by construction activities and equipment at the site of the proposed airstrip. The second is noise generated by UAS operations.

Noise is represented by a variety of metrics. Each noise metric was developed to account for the type of noise and the nature of the receptor exposed to the noise. Human hearing is more sensitive to medium and high frequencies than to low and very high frequencies, so it is common to use "A-weighted" (dBA) metrics, which account for this sensitivity. This weighting provides a good approximation of the response of the average human ear and correlates well with the average person's judgment of the relative loudness of a noise event. Within this EA, A-weighted levels are used for noise and are described by the sound level[1], the Sound Exposure Level (SEL)[2], Equivalent Sound Level (L_{eq})[3], and Day Night Average Sound

[1] Sound level is the amplitude of the sound that occurs at any given time.

[2] SEL accounts for both the maximum sound level and the length of time a sound lasts. SEL does not directly represent the sound level heard at any given time, but rather provides a measure of the total sound exposure for an entire event. SEL values are analogous to a line source (a moving object) which has a distance variation of 3 dB per doubling, whereas L_{max} variation with distance follows a point source (a stationary object) which is 6 dB per doubling of distance. SEL for UAS are evaluated as line source.

Level (DNL)[4]. Maximum Sound Level (L_{max}) is the highest A-weighted integrated sound level measured during a single event in which the sound level changes value with time (e.g., an aircraft overflight). During an aircraft overflight, the noise level starts at the ambient or background noise level, rises to the maximum level as the aircraft flies closest to the receptor, and returns to the background level as the aircraft recedes into the distance. Noise levels are computed over a 24-hour period and adjusted for nighttime annoyances to produce the DNL.

Aircraft operations represent the most identifiable noise concern to communities, even though communities and even isolated areas receive more consistent noise from other sources (e.g., cars, construction equipment, and wind). Noise generated by aircraft overflights often receives the greatest attention with annoyance being the primary consequence of aircraft noise.

3.4.1 Affected Environment

The north end of Wallops Island is fairly remote with almost no vehicular or pedestrian activity. An evaluation of monitored noise data gathered from eight locations throughout WFF was recently completed. Noise measurements were taken from May 25 to June 2, 2011 and included noise measurements taken near the site of the proposed UAS airstrip. The results of the study provide a more detailed understanding of the background sound levels. The hourly sound levels show a diurnal variation typical of background sound levels. These sound levels varied by as much as 10 dBA from day to night, although these variations were site specific. The study also determined that the background sound levels are strongly correlated with the wind conditions. Since the site of the proposed UAS airstrip is close to the coast, off-shore breezes play a significant role in the local soundscape. The breeze causes rustling in the leaves of the local plants, raising the background sound level. The results of the study concluded that the background weekday hourly L_{eq} levels ranged from 47 dBA to 57 dBA.

Chincoteague Island and Assateague Island National Park both lie northeast of the project site. The nearest residential home (i.e., sensitive receptor) is approximately 3.1 km (1.9 mi) away on Chincoteague Island.

Construction

Construction noise varies greatly depending on the construction process, type and condition of equipment used, and the layout of the construction site. Overall, construction noise levels are governed primarily by the noisiest pieces of equipment (dump truck, front end loader, grader, etc.). Typically, the sound level attenuates or drops off at a rate of 6 dBA for each doubling of the distance (i.e., if the noise level is 76 dBA at 15 m [50 ft], it is 70 dBA at 30 m [100 ft]) from a point source (FHWA 2007). In cases where the nearby surroundings consist of an “absorptive” ground surface, such as soft dirt, grass, or scattered bushes

[3] L_{eq} represents an average of the sound energy occurring over a specified period. In effect, L_{eq} is the steady-state sound level that in a given period would contain the same acoustical energy as the time-varying sound that actually occurs during the same period. In this EA, the 1-hour L_{eq} is used. L_{eq} best describes continuous or ongoing sounds, including traffic and construction.

[4] DNL combines the levels and durations of noise events, and the number of events over a 24-hour time period; it is the community noise metric recommended by the U.S. Environmental Protection Agency (USEPA) (USEPA 1974).

and trees, an additional 1.5 dBA per doubling of distance is normally assumed, resulting in a total drop-off rate of 7.5 dBA per doubling of distance from a point source.

Operations

Noise generated by UAS varies by model and activity (i.e., idle, takeoff, steady state, or landing). The Viking 300 is the loudest of the UAS proposed for operations at the new airstrip. As such, the Viking 300 is set as the "envelope" noise source.

3.4.2 Environmental Consequences

Determination of significance of potential impacts to the noise environment from the Proposed Action is based on the level of increased noise when compared to the existing noise environment. Generally, noise exposure levels above 65 DNL are considered incompatible over residential, public use (i.e., schools), or recreational areas (USEPA 1974). Noise in the affected environment would be created during construction activities and UAS operations.

Proposed Action

Construction

Construction noise levels at a particular receptor or group of receptors can be difficult to predict. Heavy construction vehicles, the major source of noise during construction projects, are constantly moving in unpredictable patterns, therefore no one receptor is expected to be exposed to construction noise of long duration. The FHWA has developed an analysis tool, the Roadway Construction Noise Model (RCNM), which serves as a basic screening tool that can be used for the prediction of construction noise during the various stages of project development and construction (FHWA 2006). NASA employed the RCNM to assess the potential significance of noise impacts during construction of the North UAS airstrip.

The loudest phase of construction is expected to be during land clearing activities. Accordingly, the results of the analysis may be considered "worst case" and that subsequent activities (e.g., placement of fill material, paving, etc.) would have lesser effects. The RCNM analysis scenario assumed that two excavators, two dump trucks, and two chainsaws would be operating simultaneously in the same point location (and distance from receiver), which is considered conservative as it would generate the highest sound levels. Table 6 presents calculated land clearing sound levels at selected distances from the construction activity. As the areas surrounding the proposed construction site consist of forest, scrub/shrub and marsh, it is likely that sound attenuation would approach the 7.5 dBA per doubling of distance from the source, however as the model's most appropriate use is as a screening tool rather than for precise estimation, Table 6 presents a range of potential noise levels, the first from an attenuation rate of 6 dBA, followed by 7.5 dBA per doubling of distance.

Table 6. Predicted Construction Noise Levels at Selected Distances			
Distance from Source (m)	***6.0 dBA Attenuation L_{eq}***	***7.5 dBA Attenuation L_{eq}***	***Background Weekday L_{eq} (dBA)***
50	73	71	47-57
100	67	63	
200	61	56	
300	58	52	

In summary, minor, temporary impacts to the noise environment in the vicinity of the project site would occur. The use of heavy equipment for site preparation and development (e.g., vegetation removal, grading, and back fill) could potentially generate noise above average ambient noise levels; however, the noise levels would be typical of standard construction activities, and would typically occur only during normal Monday through Friday working hours (i.e., between 7:00 a.m. and 5:00 p.m.). Sensitive noise receptors would include wildlife; see Section 3.5.2 for a discussion of noise impacts to affected wildlife. It is unlikely that noise from construction activities at the site would be heard at Chincoteague Island. No other sensitive receptors are located at or near the site of the proposed airstrip.

Operations

Of the UAS currently operating and proposed for operations at the new UAS airstrip, the Viking 300 has been determined to be the loudest. The basic sound level of the Viking 300 is 70 dB at 300 m (1,000 ft) flight altitude at 100 kilometers per hour (56 knots) (this is the L_{max} occurring during the flyover). For aircraft flyovers at these speeds, the SEL is approximately 10 dB greater than the L_{max}, which would give an estimated SEL value of 80 dB for a 300 m (1,000 ft) flyover. A 150 m (500 ft) minimum cruise altitude near the airstrip is proposed. The reduction of the altitude by a factor of 2 would increase the SEL by 3 dB. Thus, the estimated SEL underneath the flight track near the airstrip at 150 m (500 ft) would be approximately 83 dB. Under the Proposed Action, it is projected that the average operational day would consist of no more than four UAS sorties, which means eight operations per day (one sortie equals one departure and one arrival).

UAS sorties would occur during daylight hours, with the potential for an occasional nighttime operation taking place under special circumstances (e.g., hurricane monitoring). Therefore, the estimated maximum DNL value underneath the flight track is calculated using the following formula:

$$DNL = SEL + 10 * \log(\text{Number of passes}) - 49.4$$ [5]

Using this formula, a maximum DNL for UAS operations under this proposal would be:

$$DNL = 83 \text{ dB SEL} + 10 * \log(8) - 49.4 = \text{DNL } 43 \text{ dB}$$

The SEL values from these events ranged from 56 dBA to 88 dBA (BRRC 2011). These levels are within the range expected from Viking 300 operations. This does not mean that the Viking 300 would not be heard; however, the noise from the proposed operations would potentially intrude into the background sound level at a rate similar to current conditions at that site. Based on the above calculation for the

[5] 49.4 equals the 10*log of the number of seconds in a 24-hour day (86,400 seconds).

Viking 300 and considering the results of the recent sound study, UAS operations would not create significant noise levels in the surrounding area, assuming the operational parameters remain as projected.

No Action Alternative

Implementation of the No Action alternative would result in no changes to existing noise conditions at the north end of Wallops Island. UAS operations would remain at present levels and continue to occur at the existing UAS airstrip located at the south end of Wallops Island.

3.5 BIOLOGICAL RESOURCES

Biological resources encompass plant and animal species and the habitats within which they occur. Biological resources for this EA include vegetation, wildlife, and special-status species.

Vegetation includes all existing upland terrestrial plant communities, wetland plant communities, and submerged aquatic vegetation, with the exception of special-status species. The affected environment for vegetation encompasses the north end of Wallops Island.

Wildlife includes all vertebrate (mammals, birds, amphibians, reptiles, and fish) and invertebrate animals with the exception of those identified as threatened, endangered, or special-status, which are discussed separately. The affected environment for wildlife also encompasses the north end of Wallops Island.

Special-status Species include any species which is listed, or proposed for listing, as threatened or endangered by the U.S. Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS) under the provisions of the Endangered Species Act (ESA); any species designated by USFWS as a "listed," "candidate," "sensitive," or "species of concern," and any species which is listed by the Commonwealth of Virginia in a category implying potential danger of extinction. Although not all special status species and/or their habitats are protected under the ESA, their consideration early in the planning process could avoid future conflicts that might otherwise occur.

Essential Fish Habitat has been delineated by NMFS and includes aquatic habitat (i.e., wetlands, coral reefs, seagrasses, and rivers) where federally managed fish species spawn, breed, feed, or grow to maturity.

3.5.1 Affected Environment

The affected environment for vegetation, wildlife, special-status species, and EFH focuses on the north end of Wallops Island where construction activities and the majority of UAS flight operations would occur. The Virginia Department of Conservation and Recreation (VDCR) Division of Natural Heritage designates conservation sites for the Commonwealth of Virginia. A conservation site may include one or more rare plants, animals, or natural communities. Conservation sites are given a biodiversity significance ranking based on rarity, quality, or number of element occurrences they contain. The VDCR has indicated that the project area is located within the North Wallops Island Conservation Site (Appendix A) and has been given a biodiversity ranking of B2 which represents a site of very high significance. The rare plants and communities of concern, as identified by VDCR in a 1994 to 1995 field survey, included the maritime dune woodland community, seaside plantain (*Plantago maritime var juncoides)*, big-head rush (*Juncus megacephalus*), and southern beach spurge (*Chamaesyce bombensis*). These species are described in the *Special-status Species* section below. During scoping for this EA, VDCR recommended that a study be performed to evaluate the project's impacts on colonial waterbirds (i.e., herons, egrets and terns) and migratory songbirds. A dditionally, VDCR recommended the following bird species be evaluated for potential impacts: peregrine falcon (*Falco peregrinus*), northern harrier (*Circus cyaneus*), piping plover (*Charadrius melodus*), Wilson's plover (*Charadrius wilsonia*), and little blue heron (*Egretta caerulea*). VDCR indicated that no documented state listed plants or insects would be affected by the Proposed Action.

3.5.1.1 Vegetation

Within and adjacent to the proposed project area there are several distinct ecological communities. These include forested uplands and non-tidal wetlands (emergent and scrub-shrub), tidal wetlands, and maritime habitat. The quality of these habitats ranges from high to low due to previous human disturbance and the presence of the non-native invasive species, common reed (*Phragmites australis*) (Timmons Group 2009). The following descriptions generally depict the habitats encountered while transiting from the drier, more central portions of the island seaward to the inshore waters of the Atlantic Ocean. Figure 12 provides the vegetation types in the affected area.

Uplands

Upland habitat is found towards the center of the project area roughly running the same southeast to northwest direction as the proposed airstrip. The eastern portion of the project area contains a larger percentage of forested and scrub-shrub uplands than the western portion. The majority of the forested upland areas are characterized as m ature pine with mixed hardwoods. Dominant species within this community include loblolly pine (*Pinus taeda),* black cherry (*Prunus serotina),* American holly (*Ilex opaca),* and eastern red cedar (*Juniperus virginiana*). Dominant species within the scrub-shrub upland areas include wax myrtle (*Myrica cerifera),* poison ivy (*Toxicodendron radiicans*), common greenbrier (*Smilax rotundifolia*), black cherry, American holly, eastern red cedar, and Sassafras (*Sassafras albidium)* (Timmons Group 2009).

Non-Tidal Wetland/Marsh

To the west of the project area and west of North Seawall Road, the dominant habitat is tidal marsh which transition into smaller areas of non-tidal Palustrine (non-tidal wetlands that are substantially covered with vegetation) emergent and scrub-shrub wetlands. Scrub-shrub wetlands are located between the tidal and non-tidal wetlands located to the north and south. Palustrine emergent wetlands are more prevalent to the north of North Seawall Road, while Palustrine scrub-shrub wetlands are more dominant to the south of the road. Palustrine scrub-shrub wetland communities are dominated by wax myrtle, poison ivy, common greenbrier, and groundsel bush (*Baccharis halimifolia).* Palustrine emergent wetlands are mainly dominated by common reed, with a low persistence of soft rush (*Juncus effuses)* in some areas. Wetlands in the affected area are provided in Figure 13; Section 3.7 provides additional discussion regarding wetlands and their classification.

Tidal Wetland/Marsh

The tidal marsh complexes are dominated by species typically occurring in these communities. Transitioning from upper tidal marsh to lower tidal marsh, dominant plant species include common reed, salt bush (*Iva frutecens)*, seashore mallow (*Kosteletzkya virginica*), marsh mallow (*Althaea officinalis*), seaside goldenrod (*Solidago sempervirens*), common glasswort (*Salicornea europaea*), salt meadow hay (*Spartina patens*), salt grass (*Distichlis spicata*), and salt marsh bulrush (*Scirpus robustus*). Typical lower tidal communities include salt meadow hay and smooth cordgrass (*Spartina alternifolia*). Non-vegetated tidal mud flats and tidal drainage patterns are present within the low marsh habitat along the southeastern boundary of the project area. Section 3.7 provides additional discussion regarding wetlands and their classification.

Maritime Habitats

Maritime habitats are those that are directly influenced by the ocean and are in close proximity to the surf and ocean breezes. These habitat types are all well outside of the project's ground disturbance zone, but they occur under the flight paths that would likely be used by UAS. Maritime habitats on north Wallops Island include dune and maritime grasslands, inter-dune swales, upper and lower beach zones, over-wash flats, and nearshore open water.

Maritime grasslands, which occur on the foredunes and secondary sand dunes, are characterized by American beachgrass (*Ammophila breviligulata*), saltmeadow cordgrass, beach panic grass (*Panicum amarum*), and seaside goldenrod. Relatively pristine occurrences of this habitat type can be found at the northern end of Wallops Island. A relatively rare plant species, southern beach spurge (*Chamaesyce bombensis*), has been documented in the area.

Inter-dune swales ("sea swales") are seasonally to semi-permanently flooded, maritime herbaceous wetlands occupying deep inter-dune basins and swales. These swales occur chiefly in the northern and north central parts of the island. Common threesquare (*Schoenoplectus pungens* = *Scirpus pungens*), other Cyperaceae, grasses such as switchgrass (*Panicum virgatum*) and saltmeadow cordgrass, rushes (*Juncus* spp.), sea pink (*Sabatia stellaris*), saltmarsh fimbristylis (*Fimbristylis spadicea*), seaside goldenrod, and other herbaceous species are present. The state rare species Carolina fimbry (*Fimbristylis caroliniana*), long-awned sprangletop (*Leptochloa fusca* ssp. f*ascicularis*), and Big-head rush have been recorded at the inter-dune swales and moist clearings at the northern end of Wallops Island.

Beach systems include upper beaches and over-wash flats, which are situated just above the mean high tide limit, but are flooded by high spring tides and storm surges. They are generally sparsely vegetated with American searocket (*Cakile edentula*), seabeach orach (*Atriplex arenaria*), and Russian thistle (*Salsola kali*), a common invasive non-native beach species.

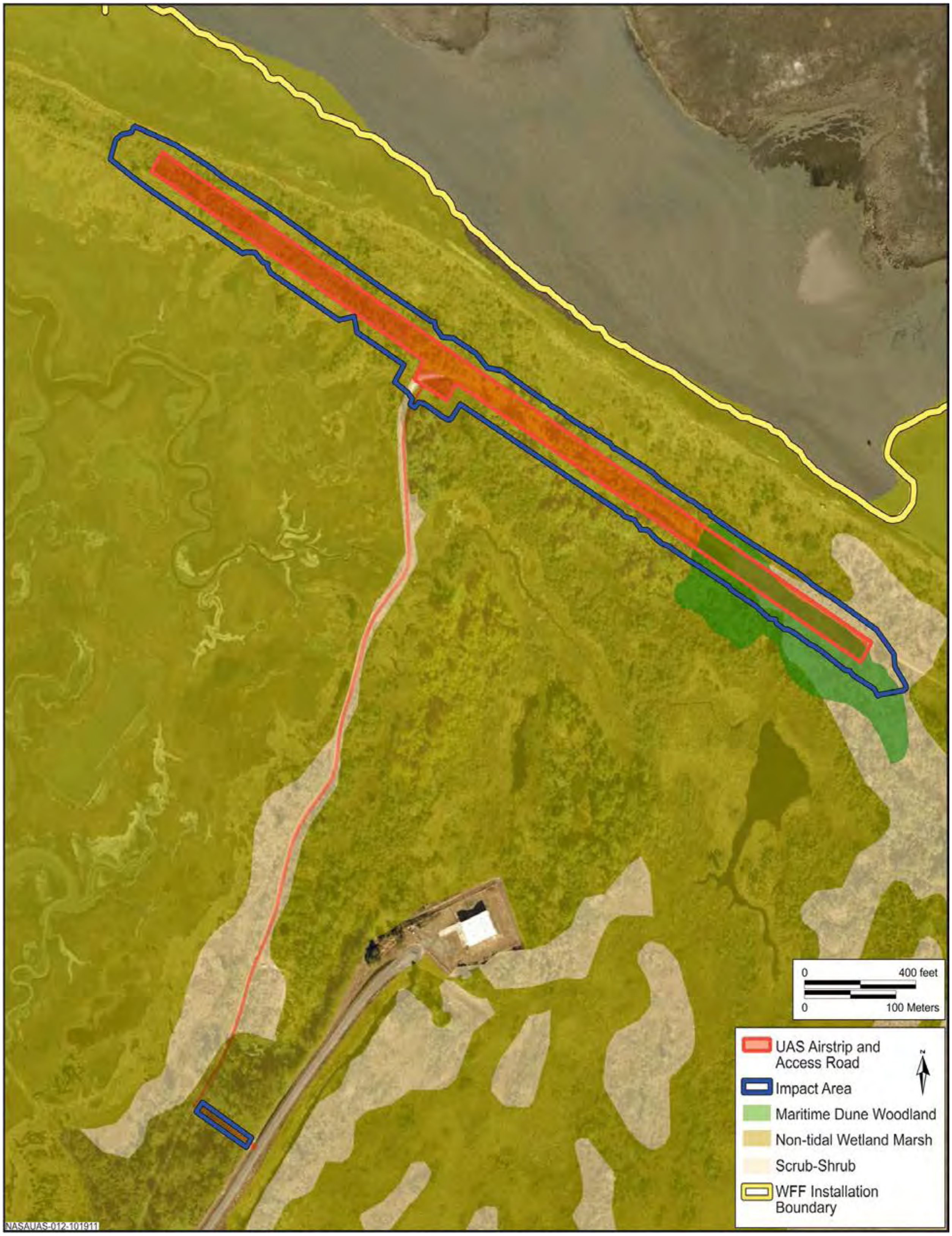

Figure 12. Vegetation Map of North Wallops Island

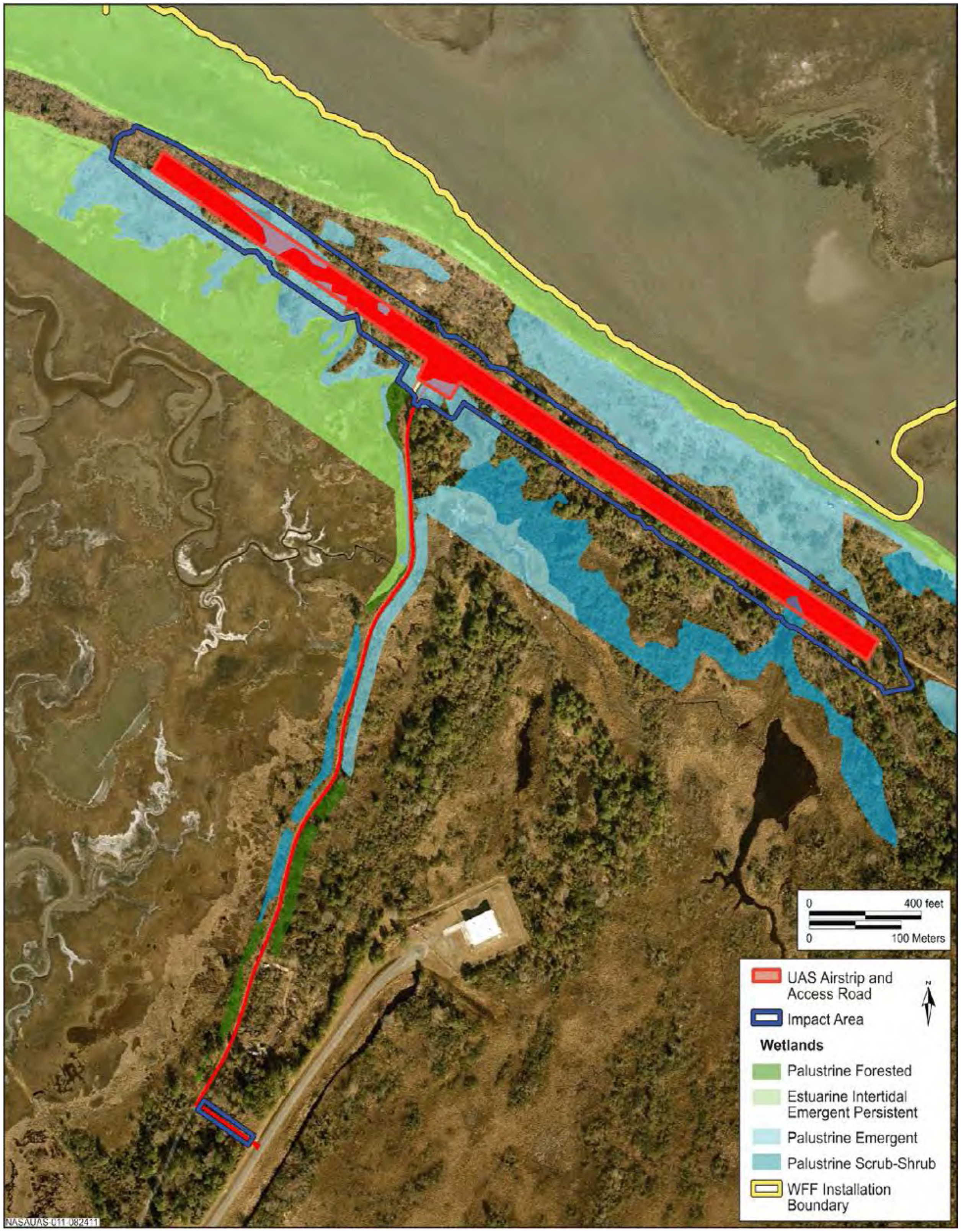

Figure 13. Wetlands Map of North Wallops Island

Marine systems consist of the open ocean overlying the continental shelf and its associated high-energy coastline. Salinities exceed 30 parts per thousand with little or no dilution except outside the mouths of estuaries. Marine systems are divided into two subsystems, subtidal and intertidal. In subtidal subsystems the substrate is continuously submerged, whereas in intertidal subsystems the substrate is exposed and flooded by tides. Substrates may consist of rock bottom, unconsolidated bottom, aquatic bed, reef, rocky shore, and unconsolidated shore. The beaches at Wallops Island are classified as intertidal with an unconsolidated sand bottom and the adjacent waters are classified as subtidal with an unconsolidated bottom. Shoreline erosion and accretion constantly change the character of the shoreline. Currently, the widest beaches on Wallops Island occur on the northern and southern portions of the east shore, with the central portion of the island being nearly devoid of beaches and protected by a seawall.

3.5.1.2 Wildlife

Mammals

Common mammals such as white-tailed deer (*Odocoileus virginianus*), opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), and grey squirrel (*Sciurus carolinensis*) are all found on the island. Raccoon and red fox (*Vulpes fulva*) are occasionally found in the upper beach zone and the inter-tidal beach zone. Smaller mammals such as the white-footed mouse (*Peromyscus leucopus*), meadow vole (*Microtus pennsylvanicus*), rice rat (*Oryzomys palustris*), and eastern cottontail (*Sylvilagus floridanus*) can also be found in portions of the island (NASA 2008e). These mammals use the maritime forest and other sections of the island for forage and shelter.

Birds

Approximately 15 species of shorebirds visit Wallops Island during the spring and fall migrations. Some of the more frequent migrants observed include sanderling (*Calidris alba*), semi-palmated plover (*Charadrius semipalmatus*), short billed dowitcher (*Limnodromus griseus*), and dunlin (*Calidris alpina*). Willets (*C.semipalmatus*) are common during the breeding season. During the summer months, three species of terns are present, including the Royal tern (*Sterna maxima*), least tern (*S. antillarum*), and common tern (*S. hirundo*). Common birds found on and near the beaches and dunes include laughing gull (*Larus atricilla*), herring gull (*L. argentatus*), and great black-backed gull (*L.marinus*). Forster's terns (*S. foresteri*) can also sometimes be found over-wintering in certain areas. Piping plover, listed as both a federally threatened and state endangered species, and Wilson's plover, a state listed threatened species, have both been known to nest on the northern and southern ends of Wallops Island (NASA 2008e). The red knot (*Calidris canutus*) a *candidate species* for federal listing can be found feeding on Wallops Island. More information on t hreatened and endangered species can be found in the Special-Status Species section.

Numerous species of wading birds, including Great Egret, *(Casmerodius albus)*, Snowy Egret *(Egretta thula)*, Cattle Egret (*Bubulcus ibis*), Great Blue Heron (*Ardea herodias*), Tricolored Heron *(E. tricolor),* Little Blue Heron *(E. caerulea),* Glossy Ibis *(Plegadis falcinellus),* and White Ibis *(Eudocimus albus)*, inhabit the marshes to the west of Wallops Island either year round or as summer visitors. The majority of wading birds at WFF are found in the extensive marsh and habitats west of Wallops Island where the shallow ponds, guts, and flats provide ample foraging area for the birds to prey on fish, crustaceans, and amphibians.

The U.S. Department of Agriculture's (USDA) Wildlife Services Office (WS) conducts surveys of birds at WFF wetland habitats several times monthly. Although these surveys are confined to the WFF Main Base marsh areas, it reasonable to assume that these results are analogous to the marsh areas to the west of Wallops Island 5km (3 mi) to the southeast. Together, Great Egrets and Glossy Ibis represent 83percent of the observations for the wading bird group. Except for the Great Blue Heron, these birds are migratory and are almost non-existent at Wallops Island during the months of November through February. Table 7 provides details on which wading bird species were observed by the WS at WFF in 2010 (Scharle and Harter 2010).

Table 7. Wading Birds Found at WFF in FY 2010

Common Name	*Percentage of Total Wading Birds Observed*
Great Egret	53
Glossy Ibis	30
Great Blue Heron	6
Snowy Egret	6
Tricolored Heron	2
Cattle Egret	1
Little Blue Heron	1
White Ibis	1

Waterfowl are another group included in the WS wildlife surveys. Except for the Canada Goose (*Branta canadensis*) and limited numbers of American Black Duck (*Anas rubripes*) and Mallards (*Anas platyrhynchos*), which are year-round residents, these birds are migratory and are not present at WFF during the spring and summer months. By far the most prevalent species found in the WFF area is the Snow Goose (*Chen caerulescens*) which represents approximately 80 percent of the waterfowl population and has been seen in the WFF area in flocks numbering hundreds, even thousands of individuals. Although this bird is often found feeding or loafing in marshes, a 2008-2009 avian survey conducted by the U.S. Navy found that snow geese at WFF are concentrated at the western fringe of the Wallops Island marshes, foraging on private agricultural lands bordering the wetland areas (personal communication, Ailes 2011). The second most abundant species at WFF is the American Black Duck which is frequently observed feeding, flying, or loafing about the Wallops Island marshes. Canada geese and mixed species of dabbling and diving ducks are also present. In Table 8 below, the waterfowl species observed at WFF by the WS in FY 2010 are listed.

Table 8. Waterfowl Found at WFF in FY 2010	
Common Name	***Percentage of Total Wading Birds Observed***
Snow Goose	80
American Black Duck	9
Canada Goose	7
Diving Ducks	2
Other Dabbling Ducks	2
Green-Winged Teal	1

The scrub shrub areas of the island are populated by various species of passerines (perching birds), including sparrows, red-winged blackbird (*Agelaius phoeniceus*), boat-tailed grackle (*Quiscalus major*), fish crow (*Corvus ossifragus*), gray catbird (*Dumetella carolinensis*), and common yellowthroat (*Geothlypis trichas*). Mourning doves (*Zenaida macroura*) are also commonly observed (NASA 2008e).

Several species of raptors also inhabit the islands including bald eagle (*Haliaeetus leucocephalus*) peregrine falcon, northern harrier, and osprey (*Pandion haliaetus*). These species are found mainly in the marshy areas to the west on Wallops Island. Great horned owls (*Bubo virginianus*) have been observed in the maritime forest.

Amphibians and Reptiles

Fowler's toad (*Bufo woodhousei*) is present on Wallops Island and can be found under stands of bayberry. Green tree frogs (*Hyla cinerea*) are often found in the northern portion of the island in freshwater depressions. Low-lying shrubby areas of the island are home to reptiles such as the black rat snake (*Elaphe obsoleta*), hognose snake (*Heterodon platyrhinos*), snapping turtle (*Chelydra serpentina*), box turtle (*Terrapene carolina*), and northern fence lizard (*Sceloporus undulatus*). Diamondback terrapin (*Malaclemys terrapin*) can be found in saltmarsh estuaries, tidal flats, and lagoons (NASA 2008e).

Invertebrates

Wallops Island, particularly the tidal marsh area, has an extensive variety of invertebrates. Saltmarsh cordgrass marshes have herbivorous (plant-eating) insects such as the saltmarsh grasshopper (*Orchelium fidicinium*) and the tiny plant hopper (*Megamelus* spp.). Plant hopper eggs are in turn preyed upon by a variety of arthropods, the group of animals that includes insects, spiders, and crustaceans. The tidal marshes are inhabited by a number of parasitic flies, wasps, spiders, and mites. The spiders prey mostly on herbivorous insects, and mites prey primarily on microarthropods (small invertebrates) found in dead smooth cordgrass. Saltmarsh mosquitoes (*Ochlerotatus sollicitans*) and greenhead flies (*Tabanus nigrovittatus*) are prevalent insects on Wallops Island. Periwinkle snails (*Littorina irrorata*) and mud snails (*Ilyanassa obsoleta*) are found on the marsh surface.

Fish

Common fish in the waters near Wallops Island and Mainland include the Atlantic croaker (*Micropogonias undulatus*), sand shark (*Carcharias taurus*), smooth dogfish (*Mustelus canis*), smooth butterfly ray (*Gymnura micrura*), bluefish (*Pomatomus saltatrix*), spot (*Leiostomus xanthurus*), and summer flounder (*Paralichthys dentatus*).

3.5.1.3 Special-Status Species

The federal ESA provides for the protection of federally listed threatened and endangered species of plants and animals, as well as designation of critical habitat for animal species. The ESA establishes the policy that federal agencies, in exercise of their authorities, shall seek to conserve and protect endangered and threatened species. It also establishes a consultation process through which federal agencies, such as NASA and USFWS, can facilitate avoidance of agency actions that would adversely affect, or result in a "take," of federally listed species or critical habitat. The taking prohibition includes any harm or harassment, and applies within the U.S. and on the high seas.

The list of federally listed threatened and endangered species that are known to occur in the region or are known to occur on Wallops Island is provided in Table 9. Where dually-listed by the State of Virginia, the state listing status is also provided. In general, this includes listed species that may be occupying habitats directly impacted by construction of the new UAS airstrip and associated facilities, as well as species that may be indirectly affected from lights, overflight UAS noise, and the visual disturbance from UAS suddenly appearing over the beach. The table also includes other species mentioned in the VDCR August 2010 scoping letter for the project, even though some have no formal federal or state protection under the federal ESA or state equivalent (in the State of Virginia - Title 29.1. *Game, Inland Fisheries and Boating. Chapter 5. Wildlife and Fish Laws. Article 6. Endangered Species*). Both the VDCR and Virginia Department of Game and Inland Fisheries (VDGIF) place emphasis on species considered to be "*Species of Greatest Conservation Need"* within the State of Virginia's Comprehensive Wildlife Conservation Strategy (VDGIF 2005). The Action Plan breaks Species of Greatest Conservation Need down into four Tiers, as follows:

- **Tier I – Species of Critical Conservation Need** – that face an extremely high risk of extinction or extirpation.
- **Tier II – Species of Very High Conservation Need –** that have a high risk of extinction or extirpation.
- **Tier III – Species of High Conservation Need –** where extinction or extirpation is possible.
- **Tier IV – Species of Moderate Conservation Need –** that may be rare in parts of their range, particularly on the periphery.

As a federal agency, NASA consults with VDCR and VDGIF on species that are dually listed under the federal ESA and state ESA. Listed species that occur on Wallops Island and have the potential to be affected by the Proposed Action are provided in Table 9. Only species that are known to occur on Wallops Island and have at least some potential to be affected by the Proposed Action are discussed further, following Table 9.

Biological Assessment and USFWS Informal Consultation

NASA prepared a Biological Assessment (BA) to evaluate potential project-related effects on federally listed species (Appendix B). These effects, along with potential effects to State listed species and State species of concern, are presented in Table 9. In a September 22, 2011, letter from the USFWS, the service concluded the informal consultation process. This letter follows the BA in Appendix B.

The USFWS concurred with NASA's determination of "no effect" to protected species from proposed construction activities since the activities would be "limited to areas outside habitat that supports the listed species." USFWS concurred with NASA's determination of "no effect" to the federally listed seabeach amaranth, Delmarva fox squirrel, and northeastern tiger beetle and NASA's determination of "may affect, but is not likely to adversely affect" piping plovers with the addition of avoidance and monitoring measures agreed to by NASA WFF and USFWS (see Chapter 4). USFWS did not concur with NASA's determination of "no effect" to sea turtles and instead determined that based on the mitigation measures proposed by NASA to minimize potential impacts to nesting sea turtles, construction and operation of the UAS airstrip would result in minor, insignificant disturbances. USFWS determined that the Proposed Action "may affect, but is not likely to adversely affect" nesting sea turtles. USFWS also determined that a Bald and Golden Eagle Act permit would not be required since the Proposed Action would not occur within known eagle concentration areas and the project would employ a 200 m (660 ft) encroachment buffer surrounding the active nest within which no construction activities would occur.

Table 9. Federal and State Listed Threatened and Endangered Species and Species of Concern Known to Occur in the Region[1]

Common Name	Scientific Name	Federal Listing Status	State Listing Status[2]	Likelihood of Occurrence	Seasonality of Occurrence	Required Habitat & Potential to Occur Onsite
Plants						
Seabeach Amaranth	*Amaranthus pumilus*	Threatened	Threatened	Slight	Year-round	Restricted to open sandy portions of ocean beaches between the high tide line and the toe of the primary dune. Nearest known location in Virginia is Hog Island. August 2010 and 2011 surveys of Wallops Island have determined that Seabeach Amaranth is not present.
Seaside Plantain	*Plantago maritime* var. *juncoides*	--	Rare	May Occur[4]	Year-round	Perennial herb in coastal wetlands with sandy soils. Documented in VDCR 1994-95 surveys as present in north Wallops Island. September 2011 VDCR survey of Wallops Island[4] has determined that Seaside Plantain is not present in the project footprint.

Table 9. Federal and State Listed Threatened and Endangered Species and Species of Concern Known to Occur in the Region[1] (con't)						
Common Name	***Scientific Name***	***Federal Listing Status***	***State Listing Status[2]***	***Likelihood of Occurrence***	***Seasonality of Occurrence***	***Required Habitat & Potential to Occur Onsite***
Plants (con't)						
Big-headed Rush	*Juncus megacephalus*	--	Rare	Known to Occur[4]	Year-round	Emergent perennial in coastal wetlands. Blooms in early summer. Several colonies found in 2011 in the "old road bed" outside of the project area. September 2011 survey of Wallops Island[4] has determined that Big-headed Rush is not present in the project footprint.
Southern Beach Spurge	*Chamaesyce bombensis*	--	Rare	May Occur[4]	Year-round	Annual forb of coastal dunes and high energy beaches. Flowers June-Oct. Documented in VDCR 1994-95 surveys as present in north Wallops Island. VDCR September 2011 survey of Wallops Island[4] has determined that Southern Beach Spurge is not present in the project footprint.
Invertebrates						
Northeast Beach Tiger Beetle	*Cicindela d. dorsalis*	Threatened	Threatened	Slight	Year-round	Present historically from Cape Cod south through the Chesapeake Bay shorelines but now believed extirpated from nearly this entire region. Normally occurs from about the fore-dune to the high tide line on ocean and bay beaches. Not known to occur on Wallops.
Fish						
Atlantic Sturgeon	*Acipenser oxyrinchus oxyrinchu*	Candidate	Tier II SGCN	May be present	All year	The life stages of Atlantic Sturgeon most vulnerable to increased sediment (i.e., from construction activities) are eggs and larvae which are subject to burial and suffocation. However, given that eggs and larvae are found solely in natal rivers, no eggs and/or larvae would be present in the project area; only sub-adults and adults may be present in nearby coastal waters.

Table 9. Federal and State Listed Threatened and Endangered Species and Species of Concern Known to Occur in the Region[1] (con't)

Common Name	Scientific Name	Federal Listing Status	State Listing Status[2]	Likelihood of Occurrence	Seasonality of Occurrence	Required Habitat & Potential to Occur Onsite
Reptiles						
Loggerhead Sea Turtle	*Caretta caretta*	Threatened	Threatened	Known to Occur	Maturation Migration May-November Nesting April-September	Nests in small numbers on sandy beaches along Virginia's coast late spring through summer, and found in Virginia's offshore coastal waters during winter and migration. Last nested on Wallops Island in 2010.
Birds						
Red Knot	*Calidris canutus*	Candidate	Tier IV SGCN	Known to Occur	Primarily Late May	A locally common to abundant transient in late spring and early fall, and does not breed in Accomack County. Preferred habitats include tidal flats and sandy or pebbly beaches. Numbers declining, but several hundred observed in 2010 at North End Curve and North End Point on Wallops Island's ocean beaches.
Piping Plover	*Charadrius melodus*	Threatened	Threatened	Known to Occur	Late April-Late August	Known to nest on Virginia's coastal beaches, dunes, and wash-over areas in late spring to mid-summer, with one brood raised per year. They feed on small invertebrates in intertidal surf zones, mud flats, tidal pool edges, barrier flats, and sand flats and along the ocean and barrier bays. Suitable nesting habitat occurs on the extreme southern and northern ends of Wallops Island and nests are observed annually.
Wilson's Plover	*Charadrius wilsonia*	--	Endangered	May Occur	Late April-Late July	Nesting pairs not observed on Wallops Island, but 32 breeding pairs reported for coastal Virginia in 2008 (Smith and Boettcher 2008).

Table 9. Federal and State Listed Threatened and Endangered Species and Species of Concern Known to Occur in the Region[1] (con't)

Common Name	Scientific Name	Federal Listing Status	State Listing Status[2]	Likelihood of Occurrence	Seasonality of Occurrence	Required Habitat & Potential to Occur Onsite
Birds (con't)						
Little Blue Heron	*Egretta caerulea*	--	Tier II SGCN	May Occur	Year-round Breeding Resident	Colonial nesting wading marsh species; once abundant, but numbers now declining in coastal Virginia. Last population estimate was 173 individuals in 8 colonies in seaside Virginia and its bay islands.[5] Not documented for Wallops Island.
Bald Eagle	*Haliaeetus leucocephalus*	BGEPA[3]	Threatened	Known to Occur	Nesting. November-July	Routine nesting species on Wallops Island. East end clear zone of proposed UAS runway abuts 200 m (660 ft) protective buffer of active nest. Several eggs laid in March 2011, but outcome not known.
Peregrine Falcon	*Falco peregrinus*	--	Threatened	Known to Occur	Nesting, March-July	Routine nesting species on Wallops Island. Nests on artificial "hacking" tower well outside of the project area. The tower was visited in April 2011; three eggs were observed in nest scrape, but outcome not known.
Northern Harrier	*Circus cyaneus*	--	Tier III SGCN	Known to Occur	Infrequent breeder; observed more often in winter months	May nest on Wallops Island in some years in upland edges of emergent marsh and moist fields. A ground nester. Coastal Virginia is at the southern end of this species breeding range in the eastern U.S.

Table 9. Federal and State Listed Threatened and Endangered Species and Species of Concern Known to Occur in the Region[1] (con't)

Common Name	Scientific Name	Federal Listing Status	State Listing Status[2]	Likelihood of Occurrence	Seasonality of Occurrence	Required Habitat & Potential to Occur Onsite
Mammals						
Delmarva Peninsula Fox Squirrel	*Sciurus niger cinereus*	Endangered	Endangered	None	Year-round	Prefers mature forest of both hardwood and pine trees with minimal understory and ground cover. Feeds primarily on nuts from oak, hickory, sweet gum, walnut and loblolly pine. While within the historic range of the species, the only known location for it in Virginia is a trans-located population at Chincoteague National Wildlife Refuge. This species does not occur on Wallops Island.

Notes:
[1]Includes species mentioned in the VDCR August 2010 scoping letter as being of concern to them due to potential impacts from the project.
[2]State Listing Status Abbreviations: **NL** = Not Listed, **Rare** = State Rare Plants (*Virginia Natural Area Preserves Act of 1989*, Code of Virginia, Section 10.1-209 through 217), **SGCN** = Species of Greatest Conservation Need.
[3]BGEPA = federally, remains protected only under the federal Bald and Golden Eagle Protection Act.
[4]Surveys were conducted by VDCR botanists (27-29 June 2011) and zoologists (19-20 June 2011) for rare plants and animals in the "North Wallops Island Conservation site," with positive findings only for big-headed rush. Additional surveys conducted 19-21 September 2011 indicate no presence of Seaside Plantain, Big-headed Rush, or Seaside Spurge in the project footprint (personal communication, Van Alstine 2011).
[5]From: "Status and Distribution of Colonial Waterbirds in coastal Virginia: 2008 Breeding Season" (Watts and Paxton 2009).

Seaside Plantain, Big-headed Rush, and Southern Beach Spurge

These species of plants considered as special status species by the Commonwealth of Virginia were previously documented as occurring in the project area during surveys conducted by VDCR staff in 1994-1995. The Commonwealth considers portions of the project area to be part of a state-designated "North Wallops Island Conservation Site," which was provided this special designation largely because it represented a prime example of Maritime Dune Woodland (Black Cherry Xeric), a habitat type that is declining and becoming rare in coastal Virginia. Other communities partially represented in this conservation site include Maritime Dune Grassland and Maritime Dune Scrub. In order to help determine the present extent of these rare habitat types in the project area, WFF commissioned field surveys to be conducted in 2011 by VDCR staff botanists and zoologists. Initial results submitted by VDCR indicate that dramatic habitat changes have taken place in this portion of Wallops Island since the original surveys were completed nearly 17 years ago (Van Alstine et al. 2011). Dense wax myrtle thickets have taken over much of the area's understory, along with extensive brambles of poison ivy and catbrier (*Smilax* spp.), and dense stands of the invasive common reed; these types of ecological changes are typically indicative of ongoing disturbance, either natural or man-made. The 2011 study revealed that no occurrences of seaside plantain, big-headed rush, or southern beach spurge remain in the project footprint. Additionally, with the aid of global positioning system (GPS) equipment, VDCR delineated a much smaller area for the maritime dune woodland than was originally reported in the 1994-1995 study.

During the 2011 survey, VDCR botanists discovered a plant that they tentatively identified as Florida Thoroughwort (*Eupatorium anomalum.*). This perennial forb prefers flat, wet, low ground exposed to full or partial sunlight. VDCR discovered plants of this species alongside the road that traverses east to west across northern Wallops Island. Florida Thoroughwort is dispersed inside and outside the UAS project footprint. The Wallops specimens represent the northernmost occurrence of the plant, found to date (Van Allstine, personal communication); typically its habitat extends from Florida to Alabama, Georgia, South and North Carolina, and most recently to Virginia. Florida Thoroughwort is commonly thought to be a hybrid of two other plants in the Eupatorium genus, *E. mohrii* and *E. semiserratum*. However, DNA analysis suggests that examples of the plant in Virginia and North Carolina are actually hybrids of *E. mohrii* and *E.serotinum*. This could lead to reclassification of the plants in Virginia and North Carolina into a separate species from those in the deep south. Reclassification would make the Wallops Island plant even rarer than presently considered (Van Allstine, personal communication).

Loggerhead Sea Turtle

Although the loggerhead sea turtle (*Caretta caretta*) is the most abundant sea turtle in U.S. waters, on September 16, 2011, the USFWS and NMFS filed a final rule on the listing of the loggerhead sea turtle under the ESA. The final listing changed the species status from a single, globally threatened listing for all loggerheads to nine Distinct Population Segments (DPSs) of loggerhead sea turtles. The Northwest Atlantic Ocean DPS is listed as threatened under the ESA.

Loggerhead sea turtles are a reddish-brown sea turtle that inhabits the open sea, from nearshore littoral waters to more than 800 km (500 mi) from shore, mostly over the continental shelf, but also within bays, estuaries, lagoons, creeks, and river mouths. Nesting occurs on open high-energy, coarse-grained sandy beaches above the high-tide mark, seaward of well-developed dunes. Hatchlings drift in convergence zones in floating patches of Sargassum. As juveniles, they begin occupying the waters of the continental shelf, edge and slope from 200 m (660 ft) deep all the way into coastal waters and estuaries (Hopkins-Murphy et al. 2003). These waters comprise an important developmental habitat for this species. Juveniles and adults feed mostly on benthic invertebrates. Loggerheads do not venture into the Gulf Stream in the fall, probably to avoid being swept into the colder northern waters (Epperly et al. 1995). Loggerheads prefer steeply sloped beaches with gradual offshore approaches and are sensitive to beachfront lighting.

Loggerheads are known to migrate along the east coast of Wallops Island. Their nests are periodically found in small numbers on Virginia's beaches. It has only been in more recent years that loggerhead sea turtle nests have been periodically found on Wallops Island beaches. In 2010, four loggerhead sea turtle nests were found during June and July. The nests were located approximately 2.6 km (1.6 mi) southwest of the proposed new airstrip on north Wallops Island (NASA 2010c). No loggerhead sea turtles nests were present in 2011.

Red Knot

Red knots, a candidate species for federal listing, are a locally common to abundant transient from May 10th through June 5th and from July 20th through September 25th along the coast of Accomack County, Virginia. Red knots are rare west of the Chesapeake Bay and an uncommon to rare visitor in the winter and summer. Red knots do not breed in the vicinity of Accomack County, although they have been appearing regularly during spring migration on Wallops Island, mostly during the second half of May. The red knot, a medium sized sandpiper, is one of the longest-distance migrants known in the world (USFWS 2011). These small birds have wingspans of approximately 51 cm (20 in) and fly more than 15,000 km (9,300 mi) from south to north each spring and in reverse each autumn. These are relatively short birds with short legs, and a rusty colored head and breast that are well apparent during breeding season (they are mostly grey the rest of the year). Red knots migrate in large flocks and frequent the same stopping areas each year. Red knots survive on small mussels and other mollusks for a large percentage of the year and horseshoe crab eggs during migration (USFWS 2005). Based on survey data, during the mid-1990s, 8,000 to 10,000 individuals would migrate through the barrier islands of coastal Virginia (NASA 2009b). However, survey data throughout 2009 indicated much lower numbers of individuals. On May 8, 2009, there was a flock of approximately 1,300 individuals seen on north Wallops Island, and again in late May 2009, flocks of approximately 20 to 200 red knots were observed (NASA 2009b). Survey data for 2010 indicate that approximately 900 individuals were observed on the northern end of Wallops Island in May with the majority having been observed May 28, 2010. Survey data for 2011 indicate that red knots began arriving on May 6 (3 birds sighted), and the last bird seen was on July 19. The largest flock observed in 2011 was on May 29 and was comprised of 216 individuals. A total of 1,167 red knots were counted throughout the months of May-July (personal communication, Mitchell 2011).

Piping Plover

Piping plovers are small, beige and white shorebirds with a black band across their breast and forehead. They typically feed on invertebrates such as marine worms, beetles, fly larvae, crustaceans, and mollusks. Habitat generally consists of ocean beaches, sand, or algal flats in protected bays, while breeding occurs mainly on gently sloping foredunes or blow-out areas behind dunes (NASA 2009b). In late March or early April, after they have established territories and conducted courtship rituals, plover pairs form shallow depressions for nests where they lay their eggs in the sand. Nests can be found above the high tide line on coastal beaches, sandflats at the end of spits and barrier islands, gently sloping foredunes, blowout areas behind dunes, and over-wash areas between dunes. Nest site substrates may include a range of materials, from fine grained sands up to shells and cobbles. Nests are typically found in areas with little or no vegetation, however, occasionally nests have been found under beach grass and other vegetation (NASA 2009b).

The piping plover is an uncommon transient and summer resident of the lower Chesapeake Bay and is known to inhabit the coastal habitats of the nearby Chincoteague National Wildlife Refuge. It was first identified on northeast Wallops Island in a survey in June 28, 1995. Piping plovers are known to periodically use the sandy beaches and tidal flats along the coast of Wallops Island; piping plover nesting has been documented in recent years on Wallops Island. In 2008, two pairs of piping plovers began nesting attempts at the north end of Wallops Island, but no eggs were laid (NASA 2010c). In 2009, three pairs nested successfully on the northern beaches; in 2010, there were three nesting attempts, including one nest with 4 eggs that fledged 4 young (NASA 2010c). Of the three 2010 piping plover nests, the one nearest to the project site was at "North End Point," about 1.5 km (0.9 mi) to the south-southeast from the eastern end of the proposed airstrip (Appendix B). In 2011, there were three documented piping plover nesting attempts on Wallops Island: two nests on the north end and one on the south end. The outcomes of these nesting attempts were as follows: (1) north end, 4 eggs laid, 3 lost to storm, one chick fledged; (2) north end, 4 eggs laid, 3 hatched, but only 2 fledged; and (3) south end, 3 eggs laid, all hatched, but all lost to storm (personal communication, Mitchell 2011).

Piping plovers nest at the extreme northern and southern ends of Wallops Island (NASA 2008e). To aid in the local recovery of piping plovers, WFF closes off all non-essential access to the north and south beaches from March 14 through September 1 each year. During the remainder of the year, the recreational use of these areas is allowed and consists of both vehicular and pedestrian traffic. Measures implemented at WFF to protect piping plovers include active beach monitoring, closure of recreational beach areas upon nest identification, the installation of nest exclosures, and a predator removal program that is implemented by the USDA WS personnel (USDA 2005). NASA regularly coordinates its monitoring efforts with Chincoteague National Wildlife Refuge staff and VDGIF biologists.

Bald Eagle

Bald eagles are known to nest near the proposed airstrip; nesting activities typically begin in November and conclude in summer when the young fledge. The bald eagle was formerly listed as endangered but has been de-listed and is now considered recovered; it is, however, provided protection under the federal Bald and Golden Eagle Protection Act. Bald eagles also remain listed by the Commonwealth of Virginia as a threatened species. On March 19, 2011, the College of William and Mary's Center for Conservation Biology flew a raptor survey over Virginia's eastern shore. They observed that the bald eagle nest was active and contained eggs (personal communication, Mitchell 2011).This nest is located approximately 215 m (700 ft) from the east end of the proposed UAS airstrip; a 200 m (660 ft) buffer around the bald eagle's nest would be observed (refer to Figure 9).

Peregrine Falcon

A pair of peregrine falcons has previously nested on a tower on the northwest side of Wallops Island, approximately 1,000 m (3,300 ft) from the project site; the tower was erected specifically for this species' use. The WFF Protected Species monitoring team visited the peregrine nesting tower on April 14, 2011. The female flushed from the tower and three eggs were observed in the nest (personal communication, Mitchell 2011). Peregrines are considered a success story of the federal ESA and were deemed recovered and subsequently delisted as an endangered species by USFWS in August 1999. Peregrine falcons are; however, still considered a state listed threatened species in Virginia.

3.5.1.4 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) of 1976 established eight regional Fishery Management Councils (FMCs) responsible for the protection of marine fisheries. A 1996 amendment to the Act instituted a new mandate to identify and provide protection to important marine and anadromous fisheries habitat, or EFH. FMCs, with assistance from the NMFS, are required to delineate EFH in fisheries management plans for all federally managed fisheries in order to conserve and enhance those habitats. EFH may be applied to individual fish species or to an assemblage of species. EFH is defined in the MSFCMA as "those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity." "Fish" is defined as finfish, crabs, shrimp, and lobsters.

The MSFCMA specifies that each federal agency shall consult with NMFS when proposing any activity that may adversely affect designated EFH. The National Oceanic and Atmospheric Administration (NOAA) divides EFH into 10-minute by 10-minute (10' by 10') geographic squares. The waters adjacent to the proposed project area are within one of these 10' x 10' square of latitude and longitude described as follows:

Boundary	North	East	South	West
Coordinate	38° 00.0 N	75° 20.0 W	37° 50.0 N	75° 30.0 W

One or more life stages of 15 federally managed fish species are designated within this square coordinate grid area. The list of the applicable EFH species and life-stages is provided in Table 10.

Table 10. EFH Species and Life-Stages in Waters Adjacent to the Proposed Construction Site

Species	*Eggs*	*Larvae*	*Juveniles*	*Adults*
Atlantic sea herring (*Clupea harengus*)				X
Atlantic sharpnose shark (*Rhizopriondon terraenovae)*				X
Black sea bass (*Centropristus striata)*			X	X
Bluefish (*Pomatomus saltatrix*)		X	X	X
Clearnose skate (*Raja eglanteria*)			X	X
Cobia (*Rachycentron canadum*)	X	X	X	X
Dusky shark (*Charcharinus obscurus*)		X	X	
King mackerel (*Scomberomorus cavalla*)	X	X	X	X
Little skate (*Leucoraja erinacea*)			X	X
Red drum (*Sciaenops occelatus*)	X	X	X	X
Red hake (*Urophycis chuss*)	X	X	X	
Sand tiger shark (*Odontaspis taurus*)		X		X
Sandbar shark (*Charcharinus plumbeus*)		X	X	X
Scalloped hammerhead shark (*Sphyrna lewini*)			X	
Scup (*Stenotomus chrysops*)			X	X
Spanish mackerel (*Scomberomorus maculatus*)	X	X	X	X
Summer flounder (*Paralicthys dentatus*)			X	X
Windowpane flounder (*Scopthalmus aquosus)*			X	X
Winter flounder (*Pleuronectes americanus*)	X	X	X	X
Winter skate (*Leucoraja ocellata*)			X	X

Note: "X" indicates that EFH has been designated within the square for a given species and life stage.
Source: NMFS 2010.

3.5.2 Environmental Consequences

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

Proposed Action

3.5.2.1 Vegetation

Uplands

The proposed construction activities would affect approximately 3.26 ha (8.05 ac) or 1 percent of the total Wallops Island upland vegetated areas from clearing. The amount of cleared land affected to accommodate the new airstrip in comparison to the current extent of upland habitat on Wallops Island, would be minor.

Non-Tidal Wetlands/Marsh

The Proposed Action would affect approximately 1.0 ha (2.47 ac) of jurisdictional non-tidal wetlands/marsh from fill activities. Further discussion on potential wetland impacts are provided in Section 3.7.2. Wetland protection measures as outlined in the *Memorandum of Agreement Between the Department of the Army and the Environmental Protection Agency, The Determination of Mitigation under the Clean Water Act Section 404 (b)(1) Guidelines* (USACE and USEPA 1990) would be followed.

Tidal Wetlands/Marsh

No tidal wetlands/marsh would be affected by the Proposed Action as the UAS airstrip has been designed to avoid this resource.

Maritime Habitats

Maritime habitats would not be affected by construction of the UAS airstrip. UAS would operate over maritime habitat areas; however, impacts to this resource would not be anticipated.

Table 11 provides the total acreage affected by clearing and fill activities associated with the UAS airstrip.

Table 11. Acreage Affected by Clearing and Fill Activities			
Plant Community Type	***Total Affected Acreage***	***Total Acreage on Wallops Island***	***Percent of Wallops Island Total Acreage***
Uplands			
Maritime Dune Woodland	0.93 ha/2.30 ac	1.95 ha/4.83 ac	47.6
Mature Pine/Mixed Hardwoods	2.08 ha/5.14 ac	65 ha/161 ac	3
Scrub/Shrub	1.18 ha/2.91 ac	57.5 ha/142 ac	2
Non-Tidal Wetlands/Marsh			
Palustrine Emergent	0.94 ha/2.32 ac	139 ha/343 ac	0.7
Palustrine Scrub/Shrub	0.06 ha/0.15 ac	116 ha/287.5 ac	0.05

Invasive Species

Construction activities and land disturbance have the potential to invite colonization of the invasive species, common reed. Rhizomes (roots) and seeds can be spread through both natural and anthropogenic means including wind, water flow, underground rhizome propagation, and equipment tracks. Numerous studies indicate that a monocultural stand of common reed has a lower ecological value (e.g., less species diversity) than the native species (e.g., *Myrica spp*.) that it outcompetes (Meyerson et al 2000). Invasion of common reed would be anticipated in low lying areas where there is ready access to ground or surface water, such as the fringes of the project area. NASA would employ USEPA approved-chemical and/or mechanical methods such as mowing to limit the spread of common reed.

3.5.2.2 Wildlife

The proposed project would present four distinct human-induced disturbances that would potentially affect wildlife. First, there would be the short-duration noise associated with construction activities. Long-term, there would be disturbances associated with permanent habitat loss, regular human presence at the airstrip, and with aircraft operation. Given the concerns raised by resource agencies during scoping for this EA, this section primarily focuses on potential effects on avian species.

Construction

Wildlife residing within the proposed construction site and along its periphery would likely be temporarily displaced as a result of the noise and activity of the construction; this can be compared to a "startle" or "flushing" response from a roost, nest, or den, which would most likely occur during an onset of activity, particularly at the beginning of a work day. However, the large amount of habitat in the vicinity of the project site would provide adequate refuge.

In addition to startle effects, there is the potential for a more persistent effect of construction noise on birds that rely on acoustic communication and song learning. This effect on avian vocal communications, typically referred to as masking, can alter birds' ability to find mates, defend territories, and numerous other social behaviors (Dooling and Popper 2007). In addition, birds use hearing to sample the sounds in their environment which may arise from biological or non-biological sources such as predators or the wind moving through trees.

To determine the effects of noise on bird hearing, one must consider the spectrum level of noise (defined as the energy level for each frequency in the sound) in the frequency region where birds vocalize most and hear best – typically around 2-4 kilohertz (kHz) (Dooling and Popper 2007). Examination of non-strike construction (i.e., work that does not include "impact" activities such as pile driving or jack hammering) noise generally shows less sound energy is generated at 2-4 kHz than at lower frequencies (Dooling and Popper 2007). Thus, lower-frequency construction noise will cause less masking than other environmental noises of equal overall level but that contain energy in a higher spectral region around 2-4 kHz (e.g., insects, vocalizations of other birds). Accordingly, the results of the RCNM analysis summarized in Section 3.4.2 that provides sound levels as dBA will overestimate the energy in the region of 2-4 kHz, thereby presenting a very conservative estimate of the effects of construction noise on communication in birds (Dooling and Popper 2007).

As a rule, there is no widely-accepted threshold for potential effects of noise on communication in birds. An informal threshold of 60 dBA hourly L_{eq} has been employed by USFWS on construction projects in the past, particularly in California; however the validity of the threshold has been questioned (Bowles and Wisdom 2005). Dooling and Popper (2007) suggest that ambient sound levels be used as guidelines for assessing potential effects of non-strike construction; this is the methodology that NASA has employed for this project.

Based upon the conservatively-derived construction noise levels described in Section 3.4.2, it is estimated that sound levels would attenuate to within background levels at a distance not likely to exceed 200-300 m (660-984 ft) from the construction activity. It should be noted that the distance from the construction site at which sound could be heard by birds would be highly dependent on atmospheric conditions, particularly wind. Studies have shown that the effects of wind on sound propagation can be substantial, with upwind attenuation approaching 25-30 dB more than downwind at the same distance from the source (Wiener and Keast 1959). Therefore, received construction-related noise levels (and resultant effects) adjacent to the site would vary.

In summary, while construction is taking place, it is expected that there may be some masking of avian communication, however it should be noted that adapting to elevated sound levels is not uncommon for birds, as this must be done during times when natural sounds, such as wind and heavy surf, reduce their ability to communicate. Species would likely employ strategies such as changing height or location, scanning the environment by turning the head, raising voice level, or timing vocal communication when there is non-continuous noise. Each of these factors alone can enhance communication in noise by as much as 10-15 dB (Dooling and Popper 2007). Construction occurring during breeding seasons (for most species, spring through mid-summer) would be the most disruptive to both terrestrial and avian species, as it could interfere with courtship and nesting activities, potentially lowering reproductive success. However the extent of potential effects is limited, and the duration of construction would not span any more than one breeding season, therefore impacts would not be substantial.

Long term, the removal of upland and wetlands habitat at the proposed project site would cause birds, mammals, reptiles, and amphibians using the uplands and wetlands within the project footprint to be permanently displaced once the land is cleared. Less mobile species at the project area would experience direct mortality. The loss of habitat is not expected to adversely affect species abundance or sustainability at the population level, as equivalent habitat types are prevalent adjacent to the project site and elsewhere on Wallops Island.

Operations

The effects of overflying manned aircraft on waterfowl and shorebirds have been well-studied in the past 20 years, with researchers reporting varying results and conclusions. Unlike manned aircraft, especially large, fast military aircraft (e.g., F-18, Osprey), the impact of UAS on birds has not been well studied, however the results of the larger vehicle studies can be applied as a proxy to estimate potential effects.

A review of the literature of manned aircraft effects indicates that at least some level of temporary startle response can be expected and anticipated, particularly in non-nesting birds. Komenda-Zehnder et al. (2003), for example, focused on determining the minimum altitude Above Ground Level (AGL) needed to minimize the stressful startle response of ducks in the Swiss lowlands to overflying aircraft and helicopters; they found that, depending on a ircraft type, between 60 and 78 percent of waterfowl exhibited "stressed" behaviors (alarm posture, swimming away, taking immediate flight) with fixed-wing aircraft flying at approximately 150 m (500 ft) AGL and generating 66-68 dB noise, while helicopters at the same altitude caused a 82-89 percent startle response rate at 75-79 dB. Waterfowl returned to a relaxed posture after 5 m inutes or so, although they did not appear to habituate or acclimate to the overflights. Smith and Visser (1993), in summarizing many Dutch studies, believe that large groups of waterfowl can habituate to overflights that occur daily, but mass startle responses can be elicited when a new type of aircraft suddenly appears, particularly at low altitudes (less than 300 m [about 1,000 ft] AGL). The potential for habituation of dabbling ducks commonly observed adjacent to the project site (e.g., black ducks, greenwing teal, etc.) is also supported by Conomy et al (1998), who suggest that habituation may have been the reason why their study in North Carolina documented very low reaction rates to military jet overflights.

Grubb (1979) evaluated the potential effects of single-propeller aircraft overflying a large, mixed species heron rookery in Saint Paul, Minnesota. Responses were observed for overflights at altitudes ranging from 45-250 m (150-800 ft) above ground level at airspeeds of 160-200 kilometers per hour (85-105 knots); sound levels (L_{max}) ranged from 61-88 dBA, depending on altitude; background sound levels were averaged at 61 dBA. The author found that neither the overflight nor the additional sound elicited responses from individuals, suggesting minimal effects. However, the authors note that the study site was adjacent to rather developed areas, and the results of the study could have reflected the species' habituation to the stimuli.

It should be noted that studies have shown the presence of humans and associated ground-based activities may also alter the behaviors of avian species. Although not in great numbers, the UAS airstrip would necessitate the presence of support personnel, including those directly involved in the mission (e.g., pilots, safety personnel, etc.) or conducting facility maintenance (e.g., removing debris, mowing, etc.) within the footprint of the project area. Erwin (1989) conducted a study of mixed colonies of wading birds (that included species of herons, egrets, and ibises*)* to determine the average distance at which each species flushed; most flushed between 30-50 m (100-165 ft) and re-settled within approximately one minute. He found that terns and skimmers were the most sensitive of observed species, flushing on the order of 150 m (490 ft) from the intrusion. The author suggested a buffer zone of 100 m (330 ft) to minimize disturbance to most birds observed, with a 200 m (660 ft) buffer for common terns and black skimmers. Rodgers and Smith (1995) also found that a buffer of 100m (330 ft) was sufficient to prevent flushing in colonies of similar species composition.

It is very likely that the recommendations of these studies are highly conservative when considered within the context of the airstrip, especially as the studies were more invasive (walking directly up to the colony) than on-site UAS support personnel would be, and many of the colonies observed were not subject to regular human visitation; flush distances may have been less if measured at locations were birds have habituated to human activity (Erwin 1989).

In summary, sound disturbance from UAS overflight noise would be expected to be minimal as UAS operations are projected to be at or below current ambient noise levels. Disturbance from visual cues or the presence of ground crew is possible, with the probability greatest at the onset of operations, with some habituation expected as operations in the area become more commonplace. Habituation would be most likely in resident populations (e.g., ducks and geese) that would be exposed to the stimuli on a regular basis. Nonresident migrants (e.g., herons and egrets) would be more likely to be disturbed. However, any disturbance would be minor and confined to a small area (100 m [330 ft] or less) immediately adjacent to the airstrip. The potential exists for birds to strike UAS aircraft; however, no incidents of such an event have been recorded at WFF (personal communication, Justis and Rew 2011).

3.5.2.3 Special-Status Species

Seaside Plantain, Big-Headed Rush, and Southern Beach Spurge

A rare plant survey of north Wallops Island was conducted by VDCR September 19-21, 2011. The survey was conducted to document the presence or absence of seaside plantain, big-headed rush, and southern beach spurge or the associated maritime dune woodland community. The September 2011 VDCR survey indicated the lack of seaside plantain, big-headed rush, and seaside spurge within the project area. Seaside plantain was not located on north Wallops Island. Big-headed rush was documented east of the project area in the swales between dunes and near the ocean. Seaside spurge was found outside of the project area (personal communication, van Alstine 2011).

The maritime dune woodland community, black cherry xeric dune woodland (U.S. National Vegetation Classification unique identifier CEGL006319), while much smaller (1.9 ha [4.8 ac]) than previously recorded, was delineated within the project area. Specifically, this type of maritime dune woodland community is dominated by black cherry, wax myrtle and greenbrier and is located near the ocean usually on the lee side of dunes in sandy or sandy/loamy soils. The community is rare in Virginia, where only three examples exist. Besides the Wallops site, there is an approximately 2 hectare (5 acre) stand at the nearby Chincoteague National Wildlife Refuge on southern Assateague Island. On Fisherman's Island at the southern end of the Delmarva Peninsula approximated 100 km (60 mi) southwest of the project site, there is an approximately 5 hectare (12 acre) stand that is classified as the same community; however there is doubt among state ecologists that this site is a true example of the type (personal communication, Fleming 2011). The community is slightly more common in other mid-Atlantic states. There are approximately 25 hectare (65 acre) at sites scattered over the Maryland portion of Assateague Island while 4 hectare (10 acre) exist on the Cape May peninsula of New Jersey (personal communication, Sneddon 2011). Delaware hosts the community at three sites: 17 hectares (42 acres) in Cape Henlopen State Park; 28 hectares (69 acres) in Delaware Seashore State Park; and 5 hectares (12.5 acre) in Thompson Island Nature Preserve for a total of 50 ha (123.5 ac) in Delaware (personal communication, Coxe 2011). Excepting the Fisherman's Island community in Virginia, there have been approximately 84 hectares (208 acres) of the CEGL006319 community identified in the mid-Atlantic region. The UAS Airstrip project is proposing to permanently remove a maximum of 0.93 hectares (2.3 acres) of this community. While this represents almost half of the black cherry xeric maritime dune woodland on Wallops Island, it is 1 percent of the type and the remaining 99 percent reside on protected conservation areas.

Although ESA requirements do not apply to the maritime dune woodland community, as it is not federally listed threatened or endangered, WFF would, to the maximum extent practicable, avoid or reduce the potential impact to the maritime dune woodland community. Additionally, while this community type is ranked locally and globally as G1/G2, or imperiled, it should be noted that the individual constituent species (i.e., black cherry, wax myrtle, and greenbrier) are extremely common on Wallops Island and the other mid-Atlantic barrier islands.

The Florida Thoroughwort extends along the roadway east of the project area foot print for approximately 140 m (470 ft). Therefore, construction of the UAS airstrip would not eradicate the species on Wallops Island. NASA would make specimens of the plant available to researchers for further study or possible transplantation before project construction begins. The 2011 VDCR surveyed was limited to the northern extent of Wallops Island and it is unknown if the plant occurs elsewhere on the island. Florida Thoroughwart has not been encountered in plant surveys on other barrier islands in the chain which stretches from Wallops Island to Fisherman's Island at the southern tip of the Delmarva Peninsula. However, Parramore Island has not been surveyed. While Florida Thoroughwort is ranked locally and globally as G2/G3, or vulnerable, it should be noted that there are two occurrences of this species (*E. mohrii* x *E. serotinum* hybrid) within the Virginia Beach city limits (one south of Sandbridge and the other at False Cape) and is also found in North Carolina. As with the maritime dune woodland community, ESA requirements do not apply to Florida Thoroughwort. NASA concludes that the UAS project would not significantly impact the species overall.

Loggerhead Sea Turtle

Loggerhead sea turtles are often seen in the channels and inlets of Virginia's barrier islands. It has only been in more recent years that loggerhead sea turtle nests have been periodically found on Wallops Island beaches. In 2010, four loggerhead sea turtle nests were found during June and July. The nests were located north of the existing south Wallops Island UAS airstrip and approximately 2.6 km (1.6 mi) southwest of the proposed new airstrip on north Wallops Island. Direct impacts to this species from the Proposed Action would not be anticipated. The project has been intentionally designed and sited to avoid disturbance to any dune or beach habitats. Nighttime lighting could disorient nesting females and emerging hatchlings; however, this type of indirect impact would not be anticipated. The following measures would be taken: 1) UAS would operate infrequently at night; 2) safety lighting, if required at the airstrip, would be of minimal intensity and downward-shielded; and 3) UAS would not use running lights. Finally, as directed by the WFF Threatened and Endangered Species Monitoring Program protocols, should WFF monitoring staff identify sea turtle nesting activity under UAS flight paths on the beach, UAS flights would be redirected or suspended until the nesting activity ceased or nestlings had completed their emergence. Given that direct impacts to sea turtle nesting habitat would be avoided, and numerous measures would be implemented to avoid lighting and UAS overflight noise disturbances, implementation of the Proposed Action would not adversely impact loggerhead sea turtles.

In a letter dated September 22, 2011, the USFWS stated that, "Based on the low number of nests at this site annually (between 1-4 nests per year), the low probability of hurricanes occurring during the nesting period here in Virginia, and the even lower probability that an emergency UAS flight would occur at night while turtles were nesting, the likelihood of disturbance resulting from UAS operations is low. Additionally, UAS operations and clearances from beach habitats will minimize the potential that UAS operations will affect sea turtles even if they do occur during nesting, and any effects are expected to be limited to temporary changes in behavior that will not reduce the likelihood of nesting. Consequently, these minor disturbances are considered to be insignificant and discountable. And the project as proposed, "may affect, but is not likely to adversely affect" nesting sea turtles."

Piping Plover

Direct impacts to this species' habitat from the Proposed Action are not anticipated because the project has been intentionally designed and sited to avoid all sensitive intertidal and over-wash habitats seaward of the dunes. In prior consultation, USFWS and NASA had agreed upon a 305 m (1,000 ft) horizontal and vertical buffers around piping plover nests. However, as previously stated, the impact of UAS on birds has not been well studied; data does not exists that quantifies these effects and verifies a buffer distance for UAS operations. Therefore, in cooperation with USFWS, NASA would undertake a study to assess the impacts of UAS operations on piping plovers. Based upon the results of the monitoring study, NASA would adopt appropriate modifications to avoidance buffers and flight paths if needed and would reinitiate consultation under Section 7, if necessary In the interim, the following measures would be taken to avoid startling nesting piping plovers: 1) UAS overflights of the beach would be infrequent (eight times per day, at most) and; 2) UAS operators would be required to maintain a flight path both 305 m (1,000 ft) vertically and horizontally away from piping plovers. Additionally, with sound levels generated by the loudest UAS type at nearly 10 dB below ambient levels measured onsite, startle responses resulting in piping plover nest abandonment would not be anticipated. Given that direct impacts to dune habitats and other maritime habitats seaward of the dunes would be avoided and that numerous measures would be implemented to minimize visual and sound disturbances, implementation of the Proposed Action would not have an adverse impact on piping plovers.

In the September 22, 2011 letter, the USFWS stated "Based on the best currently available data, the Service believes that with the conservation measures and the 1,000 foot horizontal and vertical buffers, disturbances to nesting plovers are unlikely to occur, and will be limited to temporary changes in behavior that are similar to responses to potential predators in the vicinity of nesting plovers and are unlikely to result in flushing from nests. The Service believes that the level of disturbance will be insignificant and discountable, and birds will return to normal activities quickly following disturbance, and the proposed action is not likely (to) adversely affect piping plovers. In addition, the proposed monitoring in conjunction with UAS operation has the potential to significantly improve future conservation efforts for plovers and other shorebirds."

Red Knot

Red knots occurring within the flight path of UAS overflying the beach could experience startle responses from the sudden appearance and sound generated by UAS. Some level of shorebird startle response may be elicited, particularly early on in UAS operations. In cooperation with USFWS, NASA will undertake a study to assess the impacts of UAS operations on red knots. In the interim, the following measures would be taken: 1) UAS would likely overfly the beach eight times per day, at most; and 2) with sound levels generated by the loudest UAS type actually being nearly 10 dB below ambient levels measured onsite, it is unlikely that red knots would experience any significant short or long-term effects from UAS sound or visual disturbances. Given that direct impacts to dune habitats and maritime habitats seaward of the dunes would be avoided and that numerous measures would be implemented to minimize visual and sound disturbances, implementation of the Proposed Action would be expected to have a minor but not long lasting impact to local populations of red knots.

Other Species of Concern (Raptors)

Construction activities have the potential to disturb raptors that may be adjacent to the project site. As with other avian species, the most notable concern would be interference with courtship and nesting activities, thereby lowering reproductive success. The species that could be most affected during construction is the bald eagle, as an active nest is located southeast of the project site. To mitigate the potential adverse effects during construction, NASA would employ a 200 m (660 ft) buffer around the eagle nest within which no clearing or construction activities would occur. The establishment of such a buffer is consistent with recommendations of the National Bald Eagle Management Guidelines (USFWS 2007). Peregrine falcons are known to nest well outside of the expected zone of effects from construction activities; the nearest peregrine nesting area is approximately 1,000 m (3,300 ft) from the project site. It cannot be predicted with certainty as to what distance from the project site the Northern Harrier may nest; however any disturbance associated with construction would be short duration (6-9 months) and would not persist through any more than one breeding season.

Similar to waterfowl and shorebirds (discussed above), limited information is available regarding the effects of UAS operations on raptors; all identified studies focus on larger aircraft, particularly jets, and other human-induced disturbances, including recreation, scientific research, and boating. Although these disturbances are not exactly the same as those of the Proposed Action in this EA, general conclusions can be drawn from this information.

A study of effects of low-flying military jet aircraft on eight raptor species including peregrine falcons and bald eagles found that while in some instances aircraft flights noticeably alarmed and flushed the raptor species from their roosts or nests, in most instances the overflight elicited only minimal responses and were never associated with nest failure (Ellis et al. 1991).

The literature suggests that while overflights may have some effect on the behavior of individual peregrines, it has little effect on nesting success and fledgling rate. Windsor (1977) conducted a study in which nine active peregrine nests were exposed to regular aircraft overflights ranging in altitude from 75 m (250 ft) to 300 m (1000 ft). Of the nine nests, only one was abandoned. The other eight, however showed no effect on hatch rate or fledging rate. A 2003 study (Palmer et al.), monitored the effects of low-level jet overflights on the parental behavior of peregrine falcons. Although subtle differences were detected in the parenting behavior of the overflight falcons versus that of a control group of rarely overflown birds, the researchers "found no evidence that overall attendance patterns (e.g., parenting behavior) differed depending on exposure to overflights." It should be noted that the peregrine falcon nesting tower on Wallops Island is located approximately 1,000 m (3,300 ft) southwest of the western terminus of the airstrip and is approximately the same perpendicular distance to the approach flight path of the airstrip. This distance is much greater than those used in the studies and well below the 800 m (2,600 ft) buffer distance for peregrine falcons recommended by Richardson and Miller in their 1997 paper on protecting raptors from human disturbance.

There is a little in the literature on northern harrier interactions with aircraft. In 1977, however, raptor researchers (Jackson, et al. 1977), observed a female northern harrier hunting during low lying military jet bombing runs. Throughout the bombing , the harrier continued to forage unperturbed, even when a bomb exploded 70 m (200 ft) away. This would suggest that that the species has a high tolerance for low flying aircraft and for noise disturbances.

Responses of breeding eagles depend on the type of human disturbance. Pedestrians tend to have the most extreme effects on breeding eagles when compared to boats, vehicles, short-duration noises, or aircraft; however, effects of all disturbances become more acute as an eagle's distance to the disturbance decreases (Grubb and King 1991; Grubb et al. 1992). Breeding eagles respond to long-term human activity by choosing nests sites (Fraser et al. 1985) and foraging sites (McGarigal et al. 1991) in locations with relatively low levels of human activity. Eagles also use more of the habitats within their home ranges that receive lower levels of human use (Garrett et al. 1993). Wintering (Russell 1980) and breeding bald eagles (Steidl and Anthony 1996), in areas of low human activity showed greater responses to introduced disturbances than did birds inhabiting areas where the particular disturbance occurred previously. Additionally, eagles nesting in areas where a particular disturbance was common responded less than those in areas where that disturbance was infrequent (Grubb et al. 1992). This suggests that they can habituate to particular types and levels of human activity but may be affected by a change in the amount or type of disturbance. When raptors accustomed to a particular disturbance were exposed to either a new disturbance or to the same disturbance in a different area, their responses became more intense and increased in likelihood (Stalmaster and Newman 1978).

Given the proximity of the active eagle nest to the eastern terminus of the airstrip (215 m [700ft]), NASA further consulted with USFWS in November 2011 regarding UAS overflight and the applicability of the National Bald Eagle Management Guidelines (USFWS 2007b). The Guidelines recommend a 305 m (1,000 ft) aircraft avoidance area around eagle nests during breeding season. During this coordination, NASA and USFWS agreed that given low frequency of UAS flights (approximately 1,040 sorties per year), the lateral distance of typical UAS flight paths from the nest, the infrequency of direct overflights, and the presence of screening vegetation between the nest and UAS, effects would be minor and likely would be tolerated by eagles. During construction of the runway and operation of aircraft using the runway, NASA would monitor nesting eagles, their response to aircraft, and the eagles' typical flight paths between the nest and foraging areas to evaluate potential conflicts between eagles and UAS operations, and would coordinate monitoring and results with USFWS. If monitoring indicates a potential risk to eagles or aircraft, NASA would work with USFWS and VDGIF to mitigate the risk and obtain appropriate permits, initially through hazing or other minimally disruptive actions.

In summary, the levels of disturbance that resulted from much larger, more intense stimuli in the reviewed studies seem to have insignificant effects on all raptor species. Therefore, the potential for adverse effects from UAS would also likely be low. The chance for disturbance exists; however it would most likely occur during a low-altitude direct overflight, which would be atypical (as UAS would nominally fly at 150 m (500 ft) above ground level). It is also expected that any birds in the area would likely habituate to continued operations; therefore, any notable disturbance would occur during the initial onset of flight activities, with resultant effects tapering as birds became more accustomed to activity in the area. NASA, therefore, concludes that UAS airstrip construction and operations may have long term but minor impacts on raptor species in the vicinity.

Special Status Species Monitoring

WFF intends to continue monitoring peregrine falcon use and breeding success at the hacking tower on an annual basis, as well as activity at the bald eagle nest beyond the east end of the proposed airstrip’s clear zone. WFF also has committed to annual monitoring of red knot activity, piping plover nest attempts, and loggerhead sea turtle nests on both the north and south beaches of Wallops Island, and report those results to USFWS and VDGIF. Finally, WFF has agreed to report any observations of Wilson’s plover when conducting annual shorebird monitoring (although none have been observed to date), as well as any sightings of little blue heron and northern harrier that might suggest routine wintering or breeding use of Wallops Island by these species. One final commitment made by WFF as a result of the informal Section 7 consultation for the Proposed Action is that WFF would work with USFWS to designing and implementing a shorebird monitoring study. The intent of this study would be to evaluate the potential effects from UAS overflights of beaches used by sensitive shorebird species, such as red knots and piping plovers, on such critical issues as occupancy rates, startle response, and breeding success rates.

3.5.2.4 Essential Fish Habitat

In accordance with the EFH Final Rule published in the *Federal Register* on January 17, 2002, Federal agencies may incorporate an EFH assessment into documents prepared for another purpose, such as this EA, provided the EFH assessment is clearly identified as a separate and distinct section of the document. NASA intends for this section to serve as its EFH assessment. The four major elements of the EFH assessment are discussed below:

1. A description of the Proposed Action is located in Section 2.2 of this EA;
2. An analysis of the effects of the Proposed Action on EFH, managed species, and their prey species concludes the following:
   - Construction of the UAS airstrip on north Wallops Island would occur entirely in the upland environment; no direct impact on EFH would be anticipated.
   - Temporary indirect impacts that could occur from increased erosion and sedimentation as a result of ground disturbance.
3. A formal determination of the effects of the Proposed Action on EFH:
   - NASA has determined that although the Proposed Action would result in adverse effects to EFH, those effects would not be substantial.
4. Proposed mitigation measures are as follows:
   - Indirect impacts from sedimentation and erosion would be minimized to insignificant levels through the use of BMPs, such as silt fencing and other approved measures to control erosion, sedimentation, and stormwater runoff; and
   - Avoidance and minimization measures previously discussed (i.e., retaining walls to avoid potential impacts to emergent intertidal wetlands and an infiltration trench to reduction stormwater concentrations into wetlands) would further reduce the potential to impact EFH.

No Action Alternative

There would be no impacts to vegetation, wildlife, special-status species or EFH under the No Action alternative, as no construction activities would occur. UAS operations would remain at present levels and occur at the existing south Wallops Island airstrip. These resources would continue to be managed and monitored by WFF through established procedures and protocols.

3.6 TOPOGRAPHY AND SOILS

Topography describes the physical surface characteristics of the land such as slope, elevation, and general surface features. Soil refers to unconsolidated earthen materials overlying bedrock or other parent material.

3.6.1 Affected Environment

The affected environment for topography and soils consists of the section of land on northern Wallops Island where the proposed new UAS airstrip would be constructed, along with the buffer zone around the airstrip which would be cleared during construction.

Topography

Land elevations of Wallops Island range from level with mean sea level to 4.6 m (15 ft) above mean sea level. Wallops Island is a barrier island, so its topography is constantly shifting due to ocean currents, naturally occurring erosion, deposits, and severe weather (NASA 2008e).

Soils

There are four separate soil types located in the vicinity of the proposed UAS airstrip and clear zones. A list of these soils and their characteristics is provided in Table 12.

Table 12. Soils in the Vicinity of the Proposed Action

Soil Type	*Slope*	*Drainage Class*	*Erosion Potential*	*Flooding potential*
Fisherman-Assateague fine sands complex	0-35 percent	Moderately well drained	Moderate	Rare
Fisherman-Comacca fine sands complex	0-6 percent	Moderately well drained	Moderate	Frequent
Comacca fine sand	0-2 percent	Poorly drained	Low	Frequent
Chincoteague silt loam	0-1 percent	Very poorly drained	High	Frequent

Source: NRCS 2010.

The airstrip would be constructed predominantly on Fisherman-Assateague fine sands complex. The clear zones would extend into areas containing Fisherman-Comacca fine sands complex, Comacca fine sand, and Chincoteague silt loam. No soils on Wallops Island are considered prime farmland. Comacca fine sand and Chincoteague silt loam are classified as hydric soils, and Fisherman-Comacca fine sands complex and Fisherman-Assateague fine sands complex are classified as having the potential for small inclusions of hydric soils (NRCS 2010). Soil samples collected at the project site indicate excellent infiltration rates, ranging from approximately 50 – 200 cm/hour (20 – 80 in/hour).

3.6.2 Environmental Consequences

Determination of the significance of potential impacts to topography and soils is based on identifying the locations where the Proposed Action may directly or indirectly impact geology and soil resources. Permanent alteration of the area topography or soils would be considered significant, as well if soil erosion potentials are increased to a level that would detrimentally affect the existing natural environment.

Proposed Action

The site would require grading and fill; off-site fill dirt would be required since the airstrip would need to be elevated 1 m (3 ft) above existing grade in most areas. The topography of the site would change; however, the impact would be localized and small resulting in a negligible impact. Soils at the site could be altered from the introduction of off-site soils used for fill; however, the impact would be site-specific and not present an adverse impact. Construction activities have the potential to cause soil erosion; a site specific erosion and sediment control plan would be developed and utilized to ensure that soil erosion during construction is minimal. This plan would implement BMPs that are outlined in the facility's Stormwater Pollution Prevention Plan (SWPPP) and Construction Erosion and Sediment Control Plan. These BMPs could include using silt fencing, soil stabilization blankets, and matting around areas of land disturbance during construction. Bare soils would be vegetated after construction to reduce erosion and stormwater runoff velocities. An infiltration trench, included in the airstrip design, would also minimize storm water runoff volume and velocity. Spill or leaks from construction vehicles and later from UAS refueling or personnel vehicles could affect soils; site-specific BMPS addressing spill prevention and control measures would be implemented.

No Action Alternative

Under the No Action alternative the UAS airstrip would not be constructed. The topography and soils on north Wallops Island would not be affected through implementation of this alternative as no c learing, grading, or fill generally associated with construction activities would not occur. Site-specific BMPS addressing spill prevention and control measures would continue to be implemented at the existing UAS airstrip.

3.7 WATER RESOURCES

Water resources refer to the coastal zone, surface, and subsurface water, including lakes, ponds, rivers, streams, floodplains, and wetlands that exist within the proposed project area. The CWA of 1972 is the primary federal law that protects the nation's waters, including lakes, rivers, aquifers, and coastal areas. The primary objective of the CWA is to restore and maintain the integrity of the nation's waters.

The CWA National Pollutant Discharge Elimination System (NPDES) (33 U.S.C. 1342) requires permits for stormwater discharges associated with industrial activities. The Virginia DEQ is authorized to carry out NPDES permitting under the VPDES (9 Virginia Administrative Code (VAC) 25-151). NASA maintains a WFF-wide SWPPP to ensure that its operations have minimal impact on stormwater quality.

The Virginia Stormwater Management Program (VSMP) regulations (4 VAC 3-20), administered by DCR, require that construction and land development activities incorporate measures to protect aquatic resources from the effects of increased volume, frequency, and peak rate of stormwater runoff and from increased non-point source pollution carried by stormwater runoff. The VSMP also requires that land-disturbing activities of 0.4 hectares (1 acre) or greater develop a SWPPP and acquire a permit from the Virginia DCR prior to construction.

The coastal zone is rich in natural, commercial, recreational, ecological, industrial, and aesthetic resources. As such, it is protected by legislation for the effective management of its resources. The Coastal Zone Management Act (CZMA) of 1972 (16 U.S. Code [USC] §1451, et seq., as amended) provides assistance to states, in cooperation with federal and local agencies, for developing land and water use programs in the coastal zone.

3.7.1 Affected Environment

The proposed project location on Wallops Island falls within the Upper Chesapeake subregion watershed and within the Chincoteague subbasin (NASA 2008e). Figure 14 provides a U.S. Geological Survey topographic map of Wallops Island and the surrounding waters.

Surface Waters

Surface water features on and around the proposed project area include tidal creeks and their associated tributaries, a pond, marshes, tidal flats, bays, and the Atlantic Ocean. The site is bound by the WFF to the south, Cow Gut to the west, Chincoteague Inlet to the north, and the Atlantic Ocean to the east (NASA 2009b). Surface waters in the vicinity of the proposed project area are saline to brackish and are influenced by the tides (NASA 2008e).

VDEQ has designated the surface waters in the vicinity of the project area as Class II – Estuarine Waters. The Atlantic Ocean is designated as Class I – Open Ocean. Surface waters in Virginia must meet the water quality criteria specified in 9 Virginia Administrative Code (VAC) 25-260-50. This set of criteria establishes limits for minimum dissolved oxygen concentrations, pH, and maximum temperature for the different surface water classifications in Virginia. In addition, Virginia surface waters must meet the surface water criteria specified in 9 VAC 26-260-140. This set of criteria provides numerical limits for various potentially toxic parameters. For the Class I and II waters in the vicinity of the proposed project area, the saltwater numerical criterion is applied. Both sets of standards are used by the Commonwealth of Virginia to protect and maintain surface water quality.

No wild or scenic rivers are located on, or adjacent to, Wallops Island; therefore, the Wild and Scenic Rivers Act (16 USC 1271-1287) does not apply to this project (USFWS 2007c).

Coastal Zone

The following coastal zone discussion specifically refers to compliance with the CZMA of 1972 (16 USC § 1451, *et seq*., as amended). In accordance with Section 307 of the CZMA and 15 CFR 930 subpart C, federal agency activities affecting a land or water use or natural resources of a state's coastal zone must be consistent to the maximum extent practicable with the enforceable policies of the state's coastal management program (NOAA 2006).

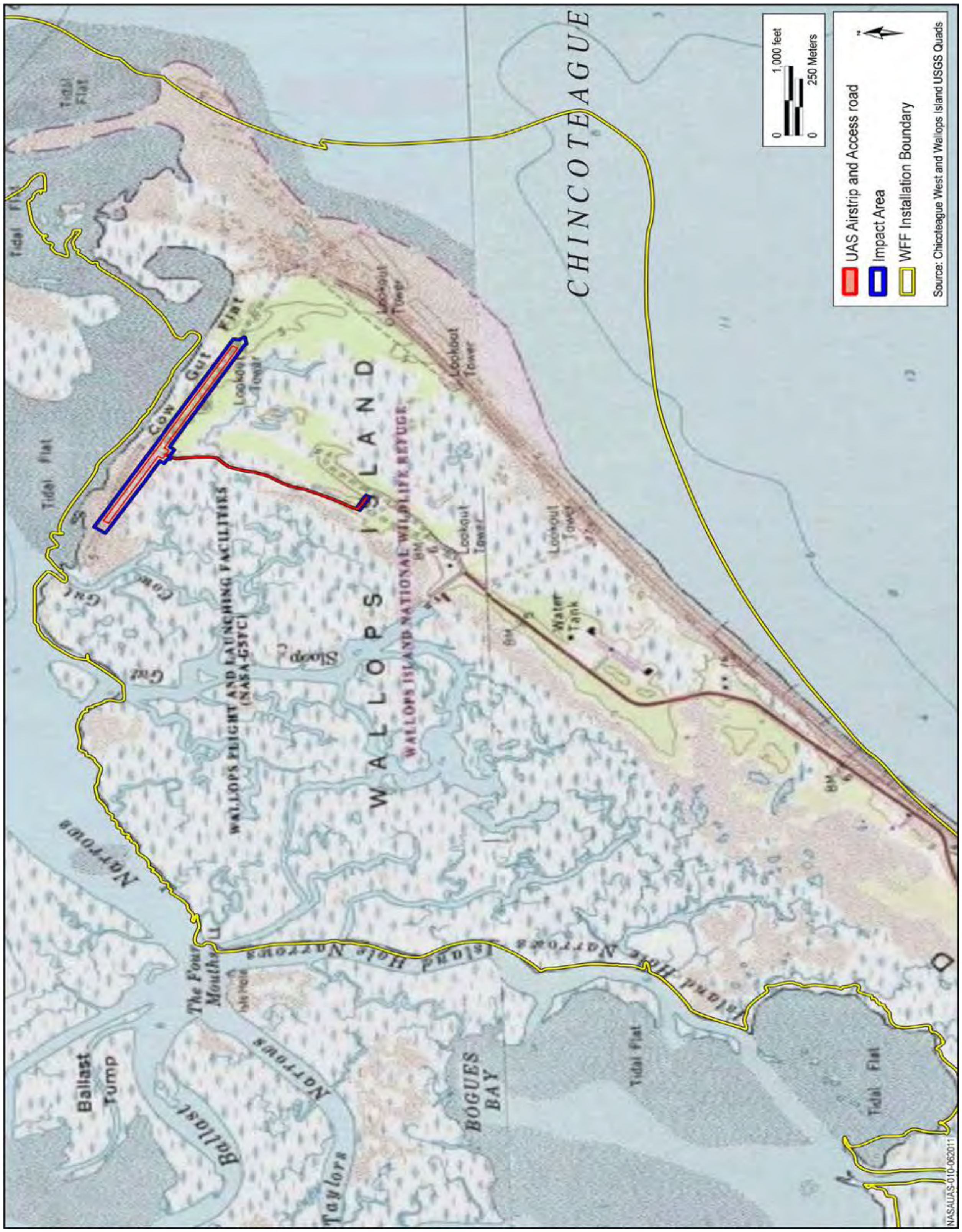

Figure 14. USGS Topographic Map of Wallops Island and the Surrounding Waters

The Virginia CZM Program was established and approved by NOAA in 1986 to protect and manage Virginia's "coastal zone." The Virginia CZM Program is part of the national CZMA, a voluntary partnership between NOAA and U.S. coastal states and territories. The Virginia CZM Program was established through an EO, which is renewed by each new governor. The Virginia CZM Program is a not a single centralized agency or entity, but a network of state agencies and local governments which administer the enforceable laws, regulations, and policies that protect Virginia's coastal resources.

Virginia's Coastal Zone includes all coastal waters of the U.S. territorial sea, extending to the 5 km (3 mi) limit of Virginia sovereignty including Accomack County. Federal lands, the use of which is by law subject solely to the discretion of, or which is held in trust by the federal government, its officers or agents, are excluded from Virginia's coastal management area. However, activities on federal lands with any reasonably foreseeable coastal effects must be consistent with the Virginia CZM Program.

Federal agencies must prepare consistency determinations if their activities can have any reasonably foreseeable effects on Virginia's coastal uses and resources (VDEQ 2010). A federal consistency determination for the proposed project is contained in Appendix C. The following enforceable policies comprising the Virginia CZM Program are applicable to the proposed airstrip project at WFF. Policies not applicable are those involving subaqueous lands management, primary dunes and shoreline sanitation, which are not affected by the Proposed Action and therefore are not discussed further.

Fisheries Management

The program stresses the conservation and enhancement of finfish and shellfish resources and the promotion of commercial and recreational fisheries to maximize food production and recreational opportunities. This program is administered by the Virginia Marine Resources Commission (VMRC) (Code of Virginia § 28.2-200 thru 28.2-713) and the VDGIF (Code of Virginia § 29.1-100 thru 29.1-570).

The State Tributyltin (TBT) Regulatory Program has been added to the Fisheries Management program. The General Assembly amended the Virginia Pesticide Use and Application Act as it related to the possession, sale, or use of marine antifoulant paints containing TBT. The use of TBT in boat paint constitutes a serious threat to important marine animal species. The TBT program monitors boating activities and boat painting activities to ensure compliance with regulations promulgated pursuant to the amendment. VMRC, VDGIF and Virginia Department of Agriculture and Consumer Services share enforcement responsibilities (Code of Virginia § 3.1-249.59 thru 3.1-249.62).

Wetlands Management

The purpose of the wetlands management program is to preserve tidal wetlands, prevent their despoliation, and accommodate economic development in a manner consistent with wetlands preservation.

- The tidal wetlands program is administered by the VMRC (Code of Virginia § 28.2-1301 thru § 28.2-1320).

- The Virginia Water Protection Permit program administered by the VDEQ includes protection of wetlands, both tidal and non-tidal. This program is authorized by Code of Virginia § 62. 1-44.15.5 and the Water Quality Certification requirements of Section 401 of the CWA of 1972.

Point Source Water Pollution Control

The point source program is administered by the State Water Control Board pursuant to Code of Virginia § 62.1-44.15. Point source pollution control is accomplished through the implementation of the National Pollutant Discharge Elimination System permit program established pursuant to Section 402 of the Federal CWA and administered in Virginia as the Virginia Pollutant Discharge Elimination System permit program.

Nonpoint Source Water Pollution Control

Virginia's Erosion and Sediment Control Law requires soil-disturbing projects to be designed to reduce soil erosion and to decrease inputs of chemical nutrients and sediments to the Chesapeake Bay, its tributaries, and other rivers and waters of the Commonwealth. This program is administered by VDCR (Code of Virginia § 10.1-560 *et. seq*.). This agency regulates activities in Chesapeake Bay Resource Management Areas and Resource Protection Areas within 84 localities in Virginia's coastal zone.

Air Pollution Control

The program implements the Federal Clean Air Act (CAA) to provide a legally enforceable State Implementation Plan for the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS). This program is administered by the State Air Pollution Control Board (Code of Virginia § 10-1.1300).

Coastal Lands Management

This program is a state-local cooperative program that is an enforceable policy of the Virginia CZM Program, as administered by the VDCR of Chesapeake Bay Local Assistance and 84 localities in Virginia's coastal zone. It was established pursuant to the Chesapeake Bay Preservation Act; Code of Virginia § 10.1 -2100 thru § 10.1 -2114 and Chesapeake Bay Preservation Area Designation and Management Regulations; 9 VAC 10-20-10 *et seq*. The Coastal Lands Management is a state-local cooperative administered by the Chesapeake Bay Local Assistance Program. In February 2009, Accomack County expanded its Chesapeake Bay Preservation Act zoning ordinance to also include those lands in the County that drain easterly to the Atlantic Ocean, forming the Chesapeake/Atlantic Preservation Area. Therefore, lands surrounding WFF are subject to the ordinance; however, as WFF is a federal property, it is not considered to be within the Chesapeake/Atlantic Preservation Area.

Floodplains

Floodplains are defined as areas likely to be inundated by a flood with a particular degree of frequency. These areas provide a host of environmental benefits, including reducing the number and severity of floods, slowing stormwater runoff, and minimizing non-point source pollution.

EO 11988, *Floodplain Management* requires federal agencies to avoid to the extent practicable any possible long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. Federal Emergency Management Agency flood insurance rate maps (FIRMs) have been prepared for most of the region, including Accomack County. FIRM Community Panels 5100010070B and 5100010100C indicate that Wallops Island is located entirely within the 100-year floodplain (NASA 2005b). A 100-year flood is a flood that has a 1 percent chance of being equaled or exceeded in any given year and is the standard used by federal agencies for floodplain management.

Wetlands

In general terms, wetlands are lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. Wetlands are transitional areas between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water (Cowardin et al. 1979). Wetlands provide a number of benefits to the environment, including water quality improvement, floodwater storage, fish and wildlife habitat, aesthetics, and biological productivity.

EO 11990, *Wetland Protection*, directs Federal agencies to minimize the destruction, loss, and degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetland communities. In Virginia, projects that impact wetlands may require permits from the USACE, VMRC, Accomack County Wetlands Board, or VDEQ. A Joint Permit Application (JPA) is filed with VMRC; the agency plays a cen tral role as an information clearinghouse for federal, state and local levels of review.

Extensive wetland systems border the project site and can typically be classified as o ne of the three following systems:

- *Estuarine* – tidal wetlands who salinities exceed 0.5 parts per thousand (ppt), at least partially enclosed by land;
- *Palustrine* – non-tidal wetlands not adjacent to rivers and lakes and tidal wetlands whose salinity does not exceed 0.5 ppt; and
- *Shallow open water* – bodies of standing water less than 2 m (7 ft) in depth free of emergent vegetation but may contain floating vegetation.

Wetlands are also classified by the types of vegetation that grow within them. Typical wetland vegetation types encountered on Wallops Island are:

- *Emergent* – dominated by erect rooted herbaceous, usually perennial plants;
- *Scrub-shrub* – dominated by woody plants less than 6m (20 ft) in height; and
- *Forested* – dominated by woody plants greater than 6m (20 ft) in height.

On the western portion of the proposed project area, west of North Seawall Road, the dominant habitat is tidal (estuarine) marsh. These tidal wetlands transition into smaller areas of non-tidal Palustrine forested, emergent and scrub-shrub wetland habitat types. The forested areas are located on the highest elevations and they transition down to scrub shrub and then emergent habitats. The non-tidal emergent wetlands typically transition into the tidal emergent wetlands. Refer to Section 3.5.2 for additional discussion of wetland vegetation.

3.7.2 Environmental Consequences

Determination of significance of potential impacts to water resources would be those actions that would have large scale adverse impacts on hydrologic function of the proposed project area. Significance determination would depend on the nature of the water resource, its importance to the ecosystem, and the ability of the system to function if that resource were altered or removed completely.

Proposed Action

Surface Waters

Construction activities would result in both short- and long-term impacts to stormwater conveyance due to raising the site elevation and removing vegetation. Short term, construction activities have the potential to cause soil erosion, potentially leading to elevated turbidity levels. However, given that site soils are sandy, the risk of turbid runoff is low. Additionally, the potential exists for the introduction of petroleum products into surface waters via unintentional spills or leaks from construction equipment.

To mitigate potential short-term impacts, prior to construction, NASA would obtain a VSMP construction site stormwater permit, develop a site-specific SWPPP, and implement site specific BMPs (summarized in Section 3.7.2). The SWPPP would identify all stormwater discharges at the site, actual and potential sources of stormwater contamination, and would require the implementation of both structural and non-structural BMPs to reduce the impact of stormwater runoff on nearby receiving waters.

The project site is primarily vegetated at the present time; removing this vegetation would also impact stormwater. Trees affect stormwater runoff through three primary processes: interception, transpiration, and infiltration. Interception is the collection of precipitation on the structure of the tree and the subsequent evaporation of moisture, which would otherwise become runoff. Transpiration is the transfer of water from the soil through the tree and its eventual release in a gaseous form through microscopic pores in the leaves and stems. Infiltration is the movement of surface water through the soil. Tree roots, combined with organic material that typically builds on the soil at the base of trees, promote the infiltration of runoff through shallow subsurface zones, helping to reduce both the rate and volume of stormwater runoff. The permanent removal of trees and scrub-shrub vegetation (and conversion to impervious surface) would increase the volume of water discharging from the immediate site during storm events.

To mitigate potential long-term impacts, NASA would incorporate permanent stormwater control measures into design plans. LID practices would be incorporated; including the integration of an infiltration trench around the site perimeter, which would capture stormwater and facilitate percolation into the surrounding soils. All stormwater control measures to would be designed and constructed in accordance with VSMP laws and regulations.

During UAS flight, the remote potential exists for a malfunction that could result in a UAS landing in coastal waters. If this were to occur, small quantities of petroleum products (e.g., gasoline, JP-5) could enter surface waters. Although no such incident has occurred during the regular use of the south Wallops Island airstrip, NASA must maintain its readiness for responding to such an event. In the event of a UAS water landing, NASA would implement the procedures in its ICP, and coordinate closely with the U.S. Coast Guard and DEQ to immediately contain and clean up any released petroleum products.

Coastal Zone

Construction and implementation of the proposed action would be consistent, to the maximum extent practicable, with the enforceable policies of Virginia's Coastal Zone Management Program; a federal consistency determination has been prepared and is included in Appendix C.

Floodplains

As outlined in Chapter 2, the only practicable alternative is to construct this runway within the floodplain. Wallops Island is located entirely within the floodplain; therefore, all activities on land would take place within the 100-year and 500-year floodplains. No practicable alternatives exist for construction on Wallops Island. The functionality of the floodplain on Wallops Island would not be reduced by implementing the Proposed Action.

NASA would ensure that its actions comply with EO 11988, *Floodplain Management*, and 14 CFR 1216.2 (NASA Regulations on Floodplain and Wetland Management) to the maximum extent possible. Since the Proposed Action would involve federally funded and authorized construction in the 100-year floodplain, this EA also serves as NASA's means for facilitating public review as required by EO 11988.

Wetlands

Non-tidal wetlands (i.e., emergent and scrub shrub) are present in the footprint of the airstrip and would be adversely affected by its construction (refer to Figure 13 and Table 11). These non-tidal wetlands have been delineated and the limits confirmed by USACE in 2009. A JPA has been prepared to secure authorization for the necessary wetland impacts.

The proposed project has been designed to avoid and/or minimize impacts to wetlands to the maximum extent practicable and to provide compensatory mitigation for unavoidable impacts to wetlands. The following provides a summary of the steps NASA has taken in consideration of the airstrip design.

- *Avoidance and Minimization* – In 2009, WFF proposed to construct a 1,600 m (5,200 ft) long by 25 m (75 ft) wide UAS airstrip at the location currently proposed; construction of the original proposed airstrip would have affected approximately 14 ha (34 ac) of wetlands (tidal and non-tidal) from clearing and fill activities. After careful consideration of the potential environmental impacts, WFF determined that a shorter airstrip would satisfy the majority of the UAS missions expected to fly at

WFF in the reasonably foreseeable future. As such, the airstrip length originally proposed has been reduced by 700 m (2,200 ft) to the proposed length of 900 m (3,000 ft) while the width of the airstrip would remain at 25 m (75 ft). Two retaining walls would be constructed along the south side of the west end of the airstrip to avoid potential impacts to approximately 0.1 ha (0.2 ac) emergent intertidal wetlands. Additionally, the airstrip staging area was reconfigured to avoid impacting 0.01 ha (0.03 ac) of forested wetlands. Reduction of stormwater runoff and its potential to impact wetlands through concentrated runoff flows resulted in design of a low impact designed infiltration trench that would run along the entire length of the airstrip (refer to Figures 10 and 11). Vegetation clearing was reduced to the minimum necessary to construct the airstrip and provide clear zones along the length and ends of the airstrip for safe operations. In summary, a reduced airstrip requirement and avoidance and minimization practices reduced the potential for wetland impacts by 12 ha (30 ac); removed potential tidal wetland and forested wetland impacts; and reduced the potential for impacts due to stormwater runoff.

- *Compensatory Mitigation* – WFF would take appropriate and practicable compensatory mitigation action for impacts to wetlands that are unavoidable under the Proposed Action in the form of paying In-lieu-fees. Federal regulation defines In-lieu-fee mitigation as "a program involving the restoration, establishment, enhancement, and/or preservation of aquatic resources through funds paid to a governmental or non-profit natural resources management entity to satisfy compensatory mitigation." WFF has consulted with VDEQ and The Nature Conservancy in Virginia for use of the Virginia Aquatic Resources Trust Fund (Trust Fund). The Trust Fund is a mitigation program which acquires stream and wetland conservation projects throughout Virginia in order to compensate for impacts to streams and wetlands permitted by state and federal regulatory agencies. The Trust Fund is administered in partnership with the USACE, VDEQ, and The Nature Conservancy. The use of the Trust Fund as a mitigation option is provided by the 2008 "Mitigation Rule" (33 CFR 332) and under the guidance of the appropriate regulatory agencies. Generally, the Trust Fund consolidates money from many projects with small impacts of less than 0.4 ha (1 ac) and pools the resources to accomplish larger projects that have a greater chance of ecological success. These funds are then used, upon approval from the USACE and VDEQ, by The Nature Conservancy to implement projects involving the restoration, enhancement and preservation of wetlands and streams. The Trust Fund helps make large-scale conservation possible.

No Action Alternative

There would be no impacts to the coastal zone, floodplains, or wetlands under the No Action alternative. There would be no construction activities and UAS operations would remain at present levels and occur at the existing UAS airstrip on the south end of Wallops Island.

3.8 CULTURAL AND TRADITIONAL RESOURCES

Cultural resources are defined as prehistoric or historic sites, buildings, structures, objects, or other physical evidence of human activity that are considered important to a culture or community for scientific, traditional, or religious reasons. Cultural resources are divided into three resource categories: archaeological, architectural, and traditional cultural resources or properties. Archaeological resources are places where people changed the ground surface or left artifacts or other physical remains (e.g., arrowheads or bottles). Archaeological resources can be classed as either sites or isolates and may be either prehistoric or historic in age. Isolates often contain only one or two artifacts, while sites are usually larger and contain more artifacts. Architectural resources are standing buildings, dams, canals, bridges, and other structures. Traditional cultural properties are resources associated with the cultural practices and beliefs of a living community that link that community to its past and help maintain its cultural identity. Traditional cultural properties may include archaeological resources, locations of historic events, sacred areas, sources of raw materials for making tools, sacred objects, or traditional hunting and gathering areas.

Section 106 of the National Historic Preservation Act of 1966, as amended, and as implemented by 36 CFR Part 800, requires federal agencies to consider the effects of their actions on historic properties before undertaking a project. An historic property is defined as any cultural resource that is included in, or eligible for inclusion in, the National Register of Historic Places (NRHP). The NRHP, administered by the National Park Service (NPS), is the official inventory of cultural resources that are significant in American history, prehistory, architecture, archaeology, engineering, and culture. The NRHP also includes National Historic Landmarks. In consideration of 36 CFR 800, federal agencies are required to initiate consultation with the State Historic Preservation Offices (SHPOs) informing them of the planned action and requesting their submittal of any comments or concerns. SHPOs are responsible for determining federal compliance with Section 106. In addition, SHPOs also prepare nominations for the NRHP.

3.8.1 Affected Environment

Archaeological Resources

One previously recorded archaeological site, a Revolutionary War earthwork (Site 44AC0089), is located within the project area. This earthwork was recorded in 1980 as part of a larger survey of Accomack and Northampton Counties (Wittkofski 1980). No additional archaeological sites have been recorded within or near the project Area of Potential Effects (APE).

In 2009, a Phase I archaeological survey and limited Phase II excavations were conducted for the proposed new airstrip at the north end of Wallop's Island (NASA 2009c). Although this study was completed for the same project as the current proposed airstrip, the APE was larger, measuring approximately 1,500 m (5,000 ft) by 34 m (112 ft). The APE has been changed to approximately 915 m (3,000 ft) by 25 m (75 ft) and shifted slightly to the south in order to avoid Site 44AC0089. Shovel testing was completed in and around Site 44AC0089 and no additional features were discovered. As a result of the survey, VDHR, the Virginia SHPO, in a November 12, 2009 letter, requested additional information to determine the eligibility of the site. In accordance with the VDHR request, additional information, including soil profiles and information on the construction of the earthworks, a site boundary map, and information on the avoidance of the site during construction activities was provided on December 13, 2010.

Architectural Resources

An architectural survey and assessment of the buildings and structures of WFF was conducted in 2003. A total of 166 architectural resources 50 years old or older (VDHR ID number 001-0027) were surveyed and evaluated for their NRHP eligibility in 2003 (NASA 2004). In consultation with the VDHR, the Virginia SHPO, in 2004, all the resources were determined not eligible except for the Wallops Beach Lifesaving Station (Station) (WFF facility number V-065) and the associated steel-frame Observation Tower (V-070). The Station is a two-and-one-half-story, wood-frame, Colonial Revival-style building. The Station was determined eligible for inclusion in the NRHP under Criterion A for its historical association with the Coast Guard and its role in protecting human lives and shipping lanes for commerce. The Station was also determined eligible under Criterion C for embodying Colonial Revival design for the Coast Guard mission in the twentieth century (NASA 2004). The four-story observation tower, which is approximately 30 m (100 ft) southeast of the Station, is not considered individually eligible, but is a contributing resource to the Lifesaving Station (NASA 2006). The property is approximately 1.2 km (0.75 mi) southwest of the location of the proposed UAS airstrip. The Wallops Beach Lifesaving Station and Observation Tower were scheduled for transfer from federal ownership and removal from the WFF because of their location within a designated explosive hazard zone for an adjacent rocket motor storage facility. This plan, however, is on indefinite hold pending studies of other alternatives. NASA would develop a Memorandum of Agreement with the Virginia SHPO to mitigate adverse effects to the historic property once a final course of action has been determined.

Two observation posts are situated within the project area of the proposed UAS airstrip. The first is observation tower V-130, which was erected by the Navy in 1949 for ordnance test range operations for the Naval Air Ordnance Test Station (NAOTS). The four-story, steel tower was determined to be not eligible for the NRHP in 2004 during the above-mentioned architectural resources survey of WFF (NASA 2004). The second observation post is the North Observation Mound. Circa 1952, this post was also built for the NAOTS. The structure consists of a 8 m (26 ft) tall, 18 by 25 m (59 by 82 ft) earthen mound topped by an 2.4 by 4.9 m (8 by 16 ft) wood deck and railing. Wood stairs are on the southeast side of the mound. The North Observation Mound was identified and evaluated in 2009 during a cultural resources survey for the Proposed Action. The mound was recommended not eligible for listing on the NRHP (NASA 2009c).

At the request of the Virginia SHPO, NASA consulted with the NPS regarding possible indirect effects (from noise) of the Proposed Action on the NRHP-eligible Assateague Beach Lifesaving Station (VDHR ID Number 001-0172). This station, also called the Assateague Beach Coast Guard Station, is located in the Assateague Island National Seashore on Toms Cove Hook. It was built by the Coast Guard in 1922.

The station was determined eligible by the Keeper of the NRHP in January 1980 (Mackintosh 1982). The station was listed on the Virginia Landmarks Register on February 20, 1973.

Traditional Cultural Properties

WFF does not possess or control Native American collections or cultural items, Native American remains, or Native American sacred sites or traditional cultural properties. The installation is currently not located within the current lands of any state or federally recognized Native American tribe (NASA 2006).

3.8.2 Environmental Consequences

Planning efforts are made to avoid known culturally important structures and sites; however, there is always the possibility for the discovery of cultural resources. Should discovery of any resources be made during clearing and construction activities, work would cease until a determination could be made by WFF's Facility Preservation Officer.

Proposed Action

Archaeological Resources

In a letter dated January 10, 2011, the Virginia SHPO concurred with NASA's eligibility determination for Site 44AC0089and concluded that with implementation of the avoidance procedures below, no adverse effect to the resource would occur (Appendix D). The following avoidance procedures would be taken to protect the earthworks site:

- Establishment of a 7.6 m (25 ft) buffer zone around the earthworks (demarcated by temporary fencing during site construction) within which no clearing would be done and the site would be maintained and preserved in its current state;
- Should it be determined that the vegetation must be removed from the site for safety concerns, trees and large vegetation would be hand-cleared from the site within the 7.6 m (25 ft) buffer zone.
- Roots of trees and other vegetation would not be removed from the earthworks to minimize damage and the site would be reseeded with an approved, non-woody ground cover.
- A long-term maintenance plan would be established that would outline procedures for yearly vegetation removal and monitoring the state of the earthworks. The plan may include observations of erosion and/or other damage to the earthworks through photo documentation and provisions for short and long term stabilization techniques and emergency stabilization in the event of natural disasters (e.g., hurricanes).
- Long-term maintenance may include the erection of a p ermanent enclosure to guard against vandalism or inadvertent damage to the site.

No adverse impacts to this resource would be anticipated with implementation of the approved avoidance procedures.

Architectural Resources

NASA consulted with the NPS regarding the potential for UAS operations and noise from UAS overflights to affect the Assateague Beach Life-Saving Station. In a letter dated August 9, 2010, the NPS determined that the Proposed Action would not impact the Assateague Island National Seashore resources (i.e., Assateague Beach Life-Saving Station) or visitor experience on the Island since the flight lines would not cross over Assateague Island and noise from UAS would not exceed ambient noise levels on Assateague Island (Appendix D). The viewshed of the Wallops Island Lifesaving Station, located approximately 1.2 km (0.75 mi) southwest of the Project Area would be screened by existing vegetation between the two areas. Additionally, typical UAS flight paths would not overfly the Station. Therefore, no impact to architectural resources would be anticipated from implementation of the Proposed Action.

Traditional Cultural Properties

No impact to these resources would be expected as none are known to exist. In the event of inadvertent discoveries during clearing or construction, the associated activity would be stopped and the WFF cultural resources manager would be notified immediately.

No Action Alternative

Under the No Action alternative, the UAS airstrip would not be built; no clearing or construction would take place. As such, no impacts to cultural or traditional resources would occur.

3.9 LAND USE, VISUAL, AND RECREATION RESOURCES

Land use generally refers to human modification of the land, often for residential or economic purposes. It can also refer to use of land for preservation or protection of natural resources such as wildlife habitat, vegetation, or other unique features. Human land uses include residential, commercial, industrial, agricultural, or recreational uses; natural features are protected under designations such as national parks, national forests, wilderness areas, or other designated areas. Land uses are frequently regulated by management plans, policies, and ordinances that determine the types of uses that are allowable or protect specially-designated or environmentally sensitive attributes.

Visual resources include the viewshed in the vicinity of the Proposed Action. This includes the natural environment, such as trees, topography, and land structure, as well as any man-made structures that currently exist within the area.

Recreation resources include primarily outdoor recreational activities that occur away from a participant’s residence. This includes natural resources and man-made facilities that are designated or available for public recreational use. The setting, activity, and other resources that influence affected recreation are also considered.

3.9.1 Affected Environment

Most of Wallops Island’s 1,680 ha (4,150 ac) consist of marshland. The remainder hosts launch and testing facilities, blockhouses, rocket storage buildings, office space, assembly shops, dynamic balancing facilities, transmitter systems, tracking facilities, Navy facilities, and other related support structures. Facilities on the Main Base include runways, hangars, offices, and housing (NASA 2008f).

Wallops Island is zoned as agricultural by Accomack County. The marsh area between Wallops Mainland and Wallops Island is designated as undeveloped in the County's Comprehensive Plan. Rural farmland and small villages make up the majority of the surrounding areas (Accomack County 2008).

Area businesses include gas stations, retail stores, markets, and restaurants. Surrounding towns include Wattsville 1.6 km (1 mi) west of the Main Base; Horntown 4 km (2.5 mi) north of the Main Base; and Atlantic 4.43 km (2.75 mi) to the southwest of the Main Base. Each of these towns has a population of less than 500 people.

The Town of Chincoteague, located approximately 24 km (15 mi) northeast of Wallops Island, on Chincoteague Island, Virginia, is the largest community in the area, with approximately 2,900 permanent residents (U.S. Census Bureau 2010). The island attracts a large tourist population during the summer months to visit the public beaches and attend the annual Assateague Island pony swim and roundup. Therefore, hotels and restaurants, as well as other seasonal tourism based businesses, can be found on Chincoteague Island.

The Wallops Island National Wildlife Refuge is located south of the Wallops Visitor Information Center and is under the jurisdiction of the USFWS. This refuge is not open to the general public. South of Wallops Island is Assawoman Island, a 576 ha (1,424 ac) parcel managed as part of the Chincoteague National Wildlife Refuge by the USFWS. The remainder of the Chincoteague National Wildlife Refuge lies mostly east and north of Wallops Island on Chincoteague Island. A string of undeveloped barrier islands, managed by the Nature Conservancy as part of the Virginia Coast Reserve, extends down the coast to the mouth of the Chesapeake Bay (USFWS 2007).

There is one main area designated for recreational use on Wallop Island. This is a beach area north of the seawall and south of the beach cable barrier. This area is open after operational hours to permanently badged WFF employees and their guests. The northern portion of this recreational area is closed annually from March through August during piping plover nesting season. A second area, the marsh under the Wallops Island Bridge that runs along the Waterway Coast of Virginia (a.k.a., Virginia Inside Passage) , is open year round; however, it may only be accessed via boat. All other recreational resources are accessed either by vehicle or foot via entrance from the main gate (NASA 2010d).

3.9.2 Environmental Consequences

Determination of the significance of potential impacts from the Proposed Action requires identification of management plans within the project area, and how the Proposed Action may alter designated land uses, as dictated by the management plan. Alteration of the viewshed would be considered significant if the Proposed Action would result in adverse impacts to the existing viewing environment. Impacts to recreational resources would be considered significant if a large portion of a particular type of recreational need was lost, and could not be suitably substituted with a similar activity, or if demand could not be met by similar facilities or natural areas.

Proposed Action

Under the Proposed Action, the UAS airstrip would be constructed in an area that is currently zoned as agricultural by Accomack County. According to Accomack County's future land use plans within its Comprehensive Plan, Wallops Island would be designated as a "conservation area." This type of land use is aimed at "preserving and protecting Accomack County's areas of ecological importance" by causing as little disturbance as possible. These areas include marshland and undeveloped barrier islands such as Wallops Island (Accomack County 2008).

Given the existing and proposed future land use designations for Wallops Island, construction of the UAS airstrip may seem to conflict with County plans. However, Accomack County has taken a "pro-WFF" stance on matters such as land use and encroachment. In its 2008 Comprehensive Plan Update, the County states that "(NASA's) need to operate these facilities in an area with low population density is also compatible with local goals to foster the agricultural industry, conserve wildlife habitat, and promote tourism" (Accomack County 2008). Therefore, construction of the UAS airstrip would be consistent with Accomack County's land use plans.

The proposed site for the UAS airstrip is in the current operations range land use area or is undeveloped. In the WFF Master Plan, the undeveloped area has been designated for future development, specifically an airstrip (NASA 2008f). The Proposed Action is consistent with the WFF Master Plan, and current and future land uses on the facility, and would not result in an adverse impact to the land use under the existing designation. Minor impacts to visual resources would occur; the viewshed would be affected by changes in the natural environment; however, the impacts would be localized and on a remote area of Wallops Island. Additionally, natural vegetation along the beachfront and tidal wetlands would shield much of the airstrip from watercraft in the nearby waters. As mandatory safety constraints would dictate closure of the area during UAS operations, the after-hours recreational use of the north Wallops Island beach by WFF personnel could be impacted. However, since after-hours operations would be infrequent, the impact would be negligible. Some areas of the open water could be closed temporarily if UAS flight safety analysis determined the need; however, this too would be infrequent resulting in negligible impacts to nearby recreational water users.

No Action Alternative

No impacts to land use, visual, and recreational resources would be anticipated under the No Action alternative. The existing land use classification would remain unchanged. The viewshed would not be changed and the lack of recreational areas on the island would remain unchanged.

3.10 AIR QUALITY

Air quality in a given location is described by the concentration of various pollutants in the atmosphere. Air quality for the affected area considers applicable regulatory requirements, types and sources of emissions (for stationary sources) and the horizontal and vertical extent of emissions from mobile sources such as construction equipment or cars, location and context of the affected area associated with the Proposed Action, and existing conditions (or affected environment).

The 1970 CAA and its subsequent amendments established the NAAQS for "criteria" pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter equal to or less than 10 and 2.5 microns (PM_{10} and $PM_{2.5}$), and lead (Pb). These standards, presented in Table 13, represent the maximum allowable atmospheric concentrations that may occur while ensuring protection of public health and welfare, with a reasonable margin of safety. Short-term standards (1-, 8-, and 24-hour periods) are established for pollutants contributing to acute health effects, while long-term standards (quarterly and annual averages) are established for pollutants contributing to chronic health effects. The Commonwealth of Virginia has adopted the Federal standards and has incorporated them by reference in 9 VAC 5-30.

Table 13. National Ambient Air Quality Standards

Pollutant	*Averaging Time*	*National Primary*	*National Secondary*
O_3	8 Hours	0.075 ppm	Same as Primary
	1 Hour	---	---
CO	8 Hours (Maximum)	9 ppm	---
	1 Hour (Maximum)	35 ppm	
NO_2	Annual Arithmetic Average	0.053 ppm	Same as Primary
	1 Hour Average	0.100 ppm	---
SO_2[a]	Annual Arithmetic Mean	0.030 ppm	---
	24 Hours (Maximum)	0.14 ppm	---
	3 Hours (Maximum)	---	0.5 ppm
	1 Hour	75 ppb	---
PM_{10}	Annual (24-hr Mean)	---	---
	24 Hours (Average)	150 µg/m3	Same as Primary
$PM_{2.5}$	Annual (24-hr Mean)	15 µg/m3	Same as Primary
	24 Hours (Average)	35 µg/m3	Same as Primary
Pb	Rolling 3-month Average	0.15 µg/m3	Same as Primary
	30-day Average		
Sulfates	24 Hours	---	---
Hydrogen Sulfide	1 Hour	---	---
Vinyl Chloride	24 Hours	---	---

Notes: Federal Standards published at CFR; Title 40, Chapter I, Subchapter C, Part 50, National Primary and Secondary Ambient Air Quality Standards, July 15, 2010.

[a]The new federal 1-hour SO_2 standard is effective August 1, 2010. The Annual and 24-hour federal standards for SO_2 are revoked effective August 1, 2010.

Legend: ppm = parts per million; µg/m^3= micrograms per cubic meter; ppb = parts per billion

Based on measured ambient criteria pollutant data, the USEPA designates all areas of the U.S. as having air quality better than (attainment) or worse than (nonattainment) the NAAQS. In addition to the ambient air quality standards for criteria pollutants, national standards exist for hazardous air pollutants (HAPs). The National Emission Standards for Hazardous Air Pollutants regulates 188 HAPs based on available control technologies. Examples of HAPs include benzene, which is found in gasoline; perchlorethlyene, which is emitted from some dry cleaning facilities; and methylene chloride, which is used as a solvent and paint stripper. Examples of other listed HAPs include dioxin, asbestos, toluene, and metals such as cadmium, mercury, chromium, and Pb compounds. The majority of HAPs are volatile organic compounds (VOCs).

Greenhouse Gases

Greenhouse Gases (GHGs) are gases that trap heat in the atmosphere. These emissions occur from natural processes and human activities. The most common GHGs emitted from natural processes and human activities include carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O); combustion sources are a prime source of these GHG emissions. Each GHG is assigned a global warming potential (GWP), which is the ability to trap heat, and is standardized to CO_2, which has a GWP value of 1. For example, N_2O has a GWP of 310, meaning it has a global warming effect 310 times greater than CO_2 on an equal-mass basis. For simplification, total GHG emissions are often expressed as a CO_2 equivalent (CO_2e). The CO_2e is calculated by multiplying each GHG emission by its GWP and adding the results to produce a combined rate to represent all GHGs emitted by an activity.

On January 24, 2007, President Bush signed EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management.* The EO addresses GHG emissions and requires each federal agency to reduce greenhouse gas emissions of the agency by 3 percent annually through the end of Fiscal Year 2015 (FY15), or 30 percent by the end of FY15, relative to the baseline of the agency's energy use in FY03. On December 21, 2007, Virginia's former governor, Timothy Kaine, issued EO 59, creating the Governor's Commission on Climate Change and setting a target of reducing statewide GHG emissions to 30 percent below business as usual (2000 levels) by 2025.

Historically, GHGs have not been regulated pollutants under the CAA. On December 7, 2009, the USEPA Administrator signed a final action finding that six GHGs constitute a threat to public health and welfare and that the combined emissions from motor vehicles cause and contribute to the climate change problem. On April 1, 2010, USEPA and the National Highway Traffic Safety Administration (NHTSA) issued the first national rule limiting GHG emissions from cars and light trucks. The requirements of the GHG light duty vehicle rule took effect on January 2, 2011 . USEPA's *Mandatory Reporting of Greenhouse Gases Rule* also became effective on January 2, 2011, requiring large stationary sources in the U.S. to report GHG emission data. In general, the rule, codified in 40 CFR Part 98, requires that facilities that emit 25,000 tonnes (27,500 tons) or more per year of GHGs are required to submit annual reports to USEPA.

USEPA and the NHTSA announced their joint Proposed Rule for *Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles* on November 30, 2010 in 75 Federal Register 74152 and have announced a Notice of Intent for *Setting Future Greenhouse Gas and Fuel Economy Standards for Passenger Cars and Light Trucks*, in October 2010. NASA will comply with all provisions of these rules as they become finalized. On January 2, 2011, Virginia passed its Final Rule on reporting of GHG emissions from stationary sources (9 VAC 85 *et seq*.). The regulation mandates controls on stationary sources of air pollutants but does not address mobile (e.g., construction equipment) sources. In this regulation, Virginia defines "significant" as 68,000 tonnes (75,000 tons) per year of CO_2e emissions.

3.10.1 Affected Environment

The region of influence for air quality for this EA is defined as the Northeastern Virginia Intrastate Air Quality Control Region (AQCR) (defined in 40 CFR Part 81.144). This AQCR includes Accomack County, and the air quality analysis for the affected area of the action therefore would primarily focus on the impacts to Accomack County and its immediate vicinity. Air quality at Wallops Island is regulated by the USEPA and VDEQ. The Northeastern Virginia Intrastate AQCR, including Accomack County, is designated in attainment/unclassifiable for all criteria pollutants.

3.10.2 Environmental Consequences

Under the Proposed Action, UAS operations would shift to the new airstrip on the north end of Wallops Island; annual UAS operations are proposed to increase by 70 percent.

Air quality impacts would be significant if emissions associated with the Proposed Action would: 1) increase ambient air pollution concentrations above the NAAQS, 2) contribute to an existing violation of the NAAQS, 3) interfere with, or delay timely attainment of the NAAQS, or 4) for mobile source emissions, result in an increase in emissions greater than 250 tons per year for any pollutant. The 250 tons per year value is used by the USEPA in their New Source Review standards as an indicator for impact analysis for listed new major stationary sources in attainment areas. No similar regulatory threshold is available for mobile source emissions, which are the primary sources for the Proposed Action. Lacking any mobile source emissions thresholds, the 250 tons per year major stationary source threshold was used to equitably assess and compare mobile source emissions.

Pollutants considered in this air quality analysis include the criteria pollutants and HAPs measured by federal standards. The Proposed Action involves the construction of a new UAS airstrip with adjacent area improvements, and subsequent flight operations at the new airstrip. In order to assess the air quality impacts of the Proposed Action, emissions for the construction and operation segments of the action were compared to the 250 tons per year threshold. Appendix E contains the detailed emission calculations prepared to assess the air quality impacts of the Proposed Action.

GHG emissions resulting from proposed construction and operation activities, deforestation at the project site and use of asphalt for the airstrip have been considered.

Proposed Action

Construction-Related Activities

Air quality impacts from construction would occur from: 1) combustion emissions due to the use of fossil fuel-powered equipment and 2) fugitive dust emissions (PM_{10} and $PM_{2.5}$) during demolition activities, earth-moving activities, and the operation of equipment on ba re soil. Fugitive dust emissions were calculated based on the total site disturbance projected for the construction project for the projected construction period of nine months.

The emissions associated with the proposed construction of the airstrip and access road upgrade from dirt to gravel are summarized in Table 14. For greenhouse gases, only CO_2 was calculated because the contribution of CH_4 and N_2O are so small as to be negligible. The calculations indicate that annual emissions for proposed construction activities would not exceed the 250 tons per year for any criteria pollutant, nor would the GHG threshold of 25,000 metric tons per year be exceeded. Air quality impacts associated with the construction activities would be minimal. Detailed calculations can be found in Appendix E.

Table 14. Estimated Emissions for Construction of UAS Airstrip

Construction Activity	***Air Pollutant Emissions (tons)***						***CO_2e***
	VOC	*CO*	*NO_x*[1]	*SO_x*[2]	*PM_{10}*	*$PM_{2.5}$*	
Construction	0.33	1.09	3.14	0.20	6.30	0.63	57
Major Source Threshold	250	250	250	250	250	250	-
GHG Threshold in metric tons per year	-	-	-	-	-	-	25,000

Notes: [1] NO_x = nitrogen oxides, [2] SO_x = sulfur oxides.

Project construction equipment would emit minor amounts of HAPs that could potentially impact public health. The main source of HAPs would occur in the form of diesel exhaust organic gases and particulates from the combustion of diesel fuel. The operation of proposed diesel-powered construction equipment would be mobile and intermittent over the course of the construction period, and would produce minimal ambient impacts of HAPs in a localized area. However, the operation of the diesel-powered equipment should include BMPs, to include a restriction on excessive idling and adherence to equipment maintenance programs to ensure excessive emissions are not generated as a result of poor maintenance. As a result, HAP emissions from construction equipment would produce less than significant impacts to public health.

Emissions from vehicular traffic associated with UAS activities would be considered minimal. Implementing the Proposed Action would not perceptibly change air emissions within Accomack County. Overall, no perceptible change in air emissions would be anticipated from implementation of the Proposed Action.

Under this proposal, approximately 3.26 ha (8.05 ac) of vegetated areas would be cleared; of this 2.08 ha (5.14 ac) would be mixed hardwoods. Trees consume CO_2, a major contributor to the greenhouse effect; leaves also absorb other air pollutants—such as O_3, CO, and SO_2—and give off oxygen. Removing trees reduces the consumption of CO_2. The addition of asphalt and use of varied sizes of diesel-fuel-consuming construction equipment would also contribute to GHG emissions. The impact of tree removal, asphalt application, and diesel-fuel consuming equipment, while adverse, would be negligible in the context of global climate change.

Operations

Operations would include the use of mobile generators to run the mobile command centers for each UAS, and the operation of the UAS themselves. The mobile generators were estimated to be rated, on average, at 60 kilowatt, or approximately 80 horsepower. The UAS primarily run on JP-5; those that are electric do not have emissions and were not included in the analysis of UAS emissions, although the use of mobile generators for the command centers was assumed for all of the UAS. Operational time frames were based on the typical flight endurance for each model of UAS that would be flown. These time frames were applied both to the aircraft and the mobile generators. Table 15 presents the estimated annual operational emissions under this Proposed Action. For GHGs, only CO_2 was calculated because the contribution of CH_4 and N_2O are so small as to be negligible. CO_2 emissions were not calculated for operation of one UAS, the GTM AirSTAR, due to insufficient information regarding fuel consumption of this 5.5 percent scale of a 757 replica. However, given the small contribution of GHG e missions associated with the combined emissions of all other UASs and the generators required to run the mobile command centers, it is clear that this omission has no impact on the resultant determination that GHG emissions from these operations are extremely small.

Air quality impacts associated with the operational activities would be minimal. Detailed calculations can be found in Appendix E.

Table 15. Estimated Annual Operational Emissions (tons)

Operational Emissions Source	*VOCs*	*CO*	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*CO_2e metric tons*
Mobile Generators		1.74	7.74	0.18	≤0.18	244.6
UAS	0.03	0.20	0.40	0.05	≤/0.05	9.6
Total per Year	0.25	1.50	2.99	0.18	≤0.18	254
Major Source Threshold	250	250	250	250	250	-
GHG Threshold in metric tons	-	-	-	-	-	25,000

CO_2e emissions under this proposal would be far less than 25,000 metric tons per year. When considered in the context of global climate change, the increase of GHG contributions would be miniscule. In context with GHG output at WFF, contributions would be negligible.

No Action Alternative

No change to existing air quality would be anticipated under the No Action alternative under which the new UAS airstrip would not be constructed. There would be no c hanges to air emissions from UAS operations that occur at present.

3.11 HAZARDOUS MATERIALS, HAZARDOUS SYSTEMS, AND HAZARDOUS WASTE MANAGEMENT

Hazardous materials, listed under RCRA, and the Emergency Planning and Community Right-to-Know Act, are defined as any substance that, due to quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to public health, welfare, or the environment. Hazardous materials are federally regulated by the USEPA in accordance with the Federal Water Pollution Control Act; CWA; Toxic Substance Control Act; RCRA; the Comprehensive Environmental Response, Compensation, and Liability Act; and CAA. The federal government is required to comply with these acts and all applicable state regulations under EO 12088. Additionally, EO 12088, under the authority of the USEPA, ensures that necessary actions are taken for the prevention, management, and abatement of environmental pollution from hazardous materials.

The WFF Integrated Contingency Plan (ICP), developed by NASA to meet the requirements of 40 CFR 112 (Oil Pollution Prevention and Response), 40 CFR 265 Subparts C and D (Hazardous Waste Contingency Plan), and 9 VAC 25-91-10 (Oil Discharge Contingency Plan), serves as the facility's primary guidance document for the prevention and management of oil, hazardous material, and hazardous waste releases (NASA 2009d).

3.11.1 Affected Environment

The affected environment for hazardous materials and systems consists of the site of the proposed airstrip and contiguous areas. Effects of hazardous materials can either be produced by the introduction of a hazardous material into the operations or how proposed operations may impact existing hazardous materials or sites. There are instances where hazardous materials, or hazardous systems, may be used during construction and subsequent UAS preparation or flight operations. A description of the categories of such hazardous materials and systems is provided below.

- **Petroleum Products –** Construction equipment would be powered by diesel and gasoline engines, with on-board fuel tanks capacities expected to range from 190 – 380 liters (50 – 100 gallons); on-board hydraulic oil capacities are estimated to range between 60-120 liters (15 – 30 gallons). The UAS are powered by engines ranging from 16 to 38 horsepower. Some UAS are also powered by turbine engines (refer to Table 1). These engines utilize either gasoline (JP-5 for larger vehicles) or batteries.
- **Chemical Materials –** Small quantities of various types of chemicals may be present in scientific instruments. These are materials (solids, liquids, or gases) that present a health risk or physical hazard to personnel, property, or the environment. For any of these materials, a Material Safety Data Sheet (MSDS) must be provided to WFF staff and be available during all parts of UAS operations (NASA 2008b). The MSDS is a standard form used to provide workers and emergency personnel with procedures for handling or working with substances in a safe manner, and includes information such as physical data (melting point, boiling point, flash point, etc.), storage, disposal, protective equipment, and spill handling procedures.
- **Lasers** – Lasers may be used as sensors or for taking scientific measurements. All operations involving the use of lasers must comply with the standards and regulations of American National Standards Institute (ANSI) Z136.1, *Safe Use of Lasers*. Access and laser illumination levels are controlled to ensure that no personnel are present within the ocular and skin hazard areas of the laser unless suitable protection is provided (NASA 2008b).
- **Radioactive Sources –** Small amounts of radioactive materials may be required in the calibration of scientific instruments. All operations must conform to the standards of the Nuclear Regulatory Commission Regulations and Chapter 6 of NPR 8715.3C *NASA General Safety Program, Nuclear Safety for Launching of Radioactive Materials* (NASA 2008b). A nuclear launch safety approval is required from the NASA Nuclear Flight Safety Assurance Manager prior to any radiological source used in flight.

NASA is working with the Baltimore District USACE on investigation of Formerly Used Defense Sites (FUDS) located on WFF (USEPA 2010). The north end of Wallops Island was used for military munitions testing and as an explosives ordnance disposal area by the Department of Defense from the mid-1940s towards the end of the 1950s. MEC may be present. The proposed airstrip would be located within and adjacent to areas of the Gunboat Point FUDS used as a S trafing Range and Explosive Ordnance Disposal Area. Signs posted by NASA at Gunboat Point notify the public of the potential munitions hazards that may exist; access to the area is restricted.

3.11.2 Environmental Consequences

The qualitative and quantitative assessment of impacts from hazardous materials or hazardous systems focuses on how and to what degree the Proposed Action would affect their use, management, and disposal. A substantial increase in the quantity or toxicity of hazardous substances or hazardous systems used or generated is considered a potentially significant impact. Significant impacts could result if there would be a substantial increase in human health risk or environmental exposure at a level that could not be mitigated to acceptable levels. A reduction in the quantity and types of hazardous substances would be considered a beneficial impact. Handling or using any hazardous material by definition could be hazardous to either individuals or the environment and result in environmental consequences. The respective MSDS for any hazardous material outlines safety procedures to be undertaken when handling hazardous materials used in a UAS. WFF personnel would be informed of the presence of any hazardous materials present in UAS proposed for operations.

Proposed Action

Construction activities would include the use of hazardous materials and may generate hazardous waste (e.g., solvents, hydraulic fluid, oil, and antifreeze) from the construction equipment. NASA would require its contractors to manage all hazardous materials and wastes in accordance with the WFF ICP and Federal, State, and local regulations. All construction and demolition debris would be characterized in accordance with *Virginia Hazardous Waste Management Regulations* and disposed of at an appropriate facility.

Contractors would be encouraged to limit the use of contractor-owned mobile aboveground storage tanks (ASTs) on the facility. Contractors would be required to notify WFF of ASTs brought to the facility with a capacity greater than 208 liters (55 gallons), and tanks of 3,785 liters (660 gallons) or greater must have NASA approval and include a spill response plan. If the tank would be in use on WFF for more than 120 days, the contractor would be required to provide proof that the tank is registered with the DEQ. WFF requires that impermeable secondary containment with 110 percent capacity be provided for all ASTs brought onto the facility by a contractor.

If stained or malodorous soil were to be encountered during construction, the contractor would be required to stop work and immediately notify the Wallops Environmental Office. Any soil that is suspected of contamination or wastes that are generated during construction-related activities would be tested and disposed of in accordance with applicable Federal, State, and local laws and regulations.

Construction of the UAS airstrip would involve filling areas to increase elevation and minimal excavation, thereby lessening the chance of encountering MEC. The contractor would be required to prepare an MEC avoidance plan that would be coordinated with the WFF Manager of Environmental Restoration. WFF personnel would provide education and oversight on the proper procedures to follow should MEC be discovered during the clearing and construction phases on the easternmost portion of the construction site. Only small amounts of fuel are required for UAS flight operations or to power portable generators. Fuels would be transported to the site utilizing Department of Transportation certified containers (NASA 2005a). No fuel would be stored on-site. Fuels and any other hazardous substance that may be associated with UAS operations would be accompanied by a MSDS. The MSDS would be available during all operations involving hazardous materials. All operators would be trained in the use of and would comply with the WFF ICP (NASA 2009d).

There may be limited use of lasers during some UAS flights. All operations involving the use of lasers would comply with the standards and regulations of ANSI Z136.1, Safety Use of Lasers, and Goddard Procedural Requirement 1860.3. Lasers entering the NAS would have a FAA letter of non-objection. Range users would provide WFF with characteristics and detailed operating procedures for controlling and use of lasers. Completing the GSFC Forms 23-28L, 23-6L, and 23-35 LU would accomplish this. All Class 3 and 4 laser operations would be approved by the Laser Safety Officer (NASA 2008b).

The Federal Nuclear Regulatory Commission (NRC) licenses the use and storage of ionizing source material, special nuclear material, and byproduct material and has issued license number 19-05748-02 to NASA for NRC-regulated radioactive materials. The NRC license is considered a Broad Type A license, generally issued to large facilities with comprehensive radiological programs. The license requires NASA to have a Radiation Safety Officer and a committee to act in place of the NRC in making day-to-day decisions. UAS may carry small quantities of encapsulated radioactive materials for instrument calibration or similar purposes. The amount and type of radioactive material that can be carried on UAS missions is strictly limited by the approval authority level delegated to the NASA NFSAM (NASA 2005). As part of the approval process, the UAS program manager must prepare a Radioactive Materials Report that describes all of the radioactive materials to be used on the UAS. The NFSAM would certify that preparation and flight of the UAS that carries small quantities of radioactive materials would not present a substantial risk to public health or safety. Adequate measures to ensure the safety of people and the environment have been established and would be instituted during the use of any hazardous materials. Accordingly, instituting the Proposed Action would not result in a significant impact to the human or natural environment.

No Action Alternative

Construction and operation of a UAS airstrip on north Wallops Island would not occur with implementation of the No Action alternative. UAS operations and the associated use of hazardous materials would continue to take place at the existing UAS airstrip on the south end of the Island.

3.12 SOCIOECONOMICS

Socioeconomics is defined as activities associated with the human environment, particularly population and typically encompasses employment, personal income, and industrial growth. Socioeconomics for this EA focus on the general features of the local economy of Chincoteague, Virginia as the town could be affected by the Proposed Action or No Action alternative.

3.12.1 Affected Environment

Wallops Island is a 15.5 square kilometer (6 square mile) island off the coast of the Eastern Shore of Virginia and is located within Accomack County, Virginia. The region of influence for socioeconomics is Accomack County which includes Chincoteague Island, a popular tourist destination located directly north of Wallops Island. This socioeconomic analysis includes data for Chincoteague and Accomack County; data for the Commonwealth of Virginia is provided as a general comparison.

Population

Chincoteague, Virginia is the closest incorporated town to the proposed UAS airstrip that is populated by the general public. As shown in Table 16, Chincoteague accounted for approximately 8.9 percent of the county population in 2010. The population of both Chincoteague and Accomack County experienced decreases in population of 47.0 and 15.5 percent, respectively, between 2000 and 2010. By comparison, the population of the Commonwealth of Virginia saw an increase of approximately 13 percent (USCB 2010).

Table 16. Chincoteague, Virginia Population

Geographic Area	2000 Population[1]	2010 Population[2]	Percent Change (2000 to 2010)
Chincoteague, Virginia	4,317	2,941	(47.0)
Accomack County	38,305	33,164	(15.5)
Commonwealth of Virginia	7,078,515	8,000,024	11.5

Sources: [1]USCB 2000; [2]USCB 2010.

Income and Employment

The median household income for Chincoteague in 2009 was $38,578; Accomack County was $40,343. Both compare much less than the Commonwealth of Virginia which reported a median household income of $60,316 (USCB 2010).

In 2009, the three largest industries in Chincoteague with respect to employment were educational services, and health care and social assistance (21.5 percent); art, entertainment, and recreation (17.8 percent); and public administration (13.6 percent). In Accomack County, the largest industries were educational services and health care and social assistance (19.8 percent), retail (12.1 percent), and manufacturing (11.6 percent). By comparison, the three largest industries in the State of Virginia were educational, health, and social services (19.83 percent); professional, scientific, and management services (13.9 percent); and retail (11.0 percent) (USCB 2010).

3.12.2 Environmental Consequences

Thresholds for significant impacts to socioeconomics are specific to the capacity of the affected area to accommodate and respond to economic and social change. The primary focus for the socioeconomic analysis is related to the short-term influx of personnel and researchers/engineers/students that would be expected to arrive during UAS test and operational campaigns.

Proposed Action

Construction activities may temporarily increase local employment opportunities and would potentially benefit local stores and businesses. UAS test and deployments would occur year-round at WFF. Two to four research scientists/engineers/students from the UAS vendor would be associated with each UAS test and/or deployment campaign. The research scientists/engineers/students would arrive and remain in the Town of Chincoteague for up to two weeks. While in Chincoteague, the research scientists/engineers/students would purchase food, supplies, and lodging. Estimates for lodging, meals, and incidentals for research scientists/students staying in Chincoteague in 2010 total nearly $213,024 (GSA 2011). The Town of Chincoteague has an adequate supply of restaurants and lodging accommodations to meet the anticipated needs of the research scientists/engineers/students under this proposal.

No Action Alternative

Socioeconomic resources would not be affected by implementation of the No Action alternative, since baseline conditions would remain unchanged. The short-term economic benefits experienced by the Town of Chincoteague from UAS test and/or deployment operations would remain unchanged.

3.13 TRANSPORTATION

Transportation resources refer to the infrastructure and equipment required for the movement of people and manufactured goods in geographic space. For purposes of evaluation in this EA, transportation refers to the movement of automobiles on roadway systems and manned aircraft in the NAS. Accordingly, impacts to rail and water transportation systems are not considered to be applicable to this analysis.

3.13.1 Affected Environment

U.S. Route 13 is a four-lane divided north-south highway that spans the Delmarva Peninsula. The local traffic travels by arteries branching off of U.S. Route 13. Access to WFF is provided by Route 175 (Chincoteague Road), a two-lane minor arterial that connects to Atlantic Road and Mill Dam Road, both of which terminate at the Main Base gate. Wallops Island is accessed via Atlantic Road which intersects with Wallops Island Road. Wallops Island Road terminates at the Mainland gate.

The proposed UAS airstrip would be located on a remote portion of Wallops Island. Because of its location, it is not routinely accessed by WFF personnel or contractors. Construction vehicles would present the greatest volume of traffic to the location.

As discussed in Section 3.2.1 *Airspace Management*, R-6604A/B is NASA-controlled/restricted airspace that overlies all of Wallops Island, the majority of the Mainland, and a portion of the Main Base runways (refer to Figure 2). R-6604A/B also connects to offshore W-386. The majority of UAS operations at WFF consist of experimental or first flight aircraft. R-6604A/B and W-386 support flight activities that could be hazardous to non-participating aircraft. When not in use, R-6604A/B and W-386 are “cold” and the airspace is returned to the NAS.

3.13.2 Environmental Consequences

Proposed Action

Traffic movement on Wallops Island Road and through WFF Mainland gate could be slowed but no long-term adverse impacts would be anticipated. Impacts to the area and WFF roadways would be minor and short-term during airstrip construction and negligible during airstrip operations from implementation of the Proposed Action or No Action alternative.

During the primary construction phase lasting roughly 9 months, approximately 10 dump trucks per day would travel round-trip on the main roads and routes. During the secondary phase, far fewer construction vehicles would be anticipated with an average of 2 per week for about 3 months. The impact to transportation on the access roads would be minimal and short-term in duration; no long-term impacts would be anticipated.

Upon completion of the new airstrip, UAS operations would commence. Vehicular traffic associated with UAS operations would shift from the south to the north end of Wallops Island. Approximately six vehicles would be required for any single UAS launch. These vehicles commonly consist of a small truck(s) to transport the UAS and other equipment to the airstrip, Winnebago-size command center, a street sweeper to clear debris off of the airstrip surface, and several government owned vehicles to transport personnel working on the launch. A fire truck stationed at Wallops Island would also be among the vehicles on-site during a launch. Operations would shift from the south to the north end of the Island; it is anticipated that UAS operations would increase with construction of the new airstrip. As such, vehicular traffic to the site would increase. However, with the small number of vehicles associated with each UAS launch, transportation to and from the site would have minimal impact to transportation resources in the affected area. No long-term impacts to this resource would be expected.

As discussed in section 3.2.2 *Airspace Management*, under the Proposed Action, UAS would continue to operate in R-6604A/B and W-386. Use of other VACAPES warning areas is possible, depending on mission requirements, but would be infrequent (personal communication, Dickerson 2010). Civil aircraft operations within the WFF region would not be measurably affected by UAS operations at the new airstrip or within testing airspace due to restricted airspace and warning area separation rules. Given that UAS activity would increase at WFF, the restricted airspace would be activated more frequently, thereby diverting non-participating aircraft either above or around the “no-fly zones.” Conditions under which general aviators or civilian pilots would need to request permission to enter R-6604A/B or W-386 when active would remain unchanged. NOTAMs broadcast by the FAA would continue to be issued when these areas are activated.

No-Action Alternative

Under this alternative, construction of a new UAS airstrip would not occur. The number and frequency of vehicles travelling associated with UAS operations at the existing UAS airstrip would not be expected to increase beyond baseline conditions.

3.14 APPLICABLE STATUES AND REGULATIONS

This section of the EA contains a list of known approvals, licenses, or permits that would be required to implement the Proposed Action. All would be obtained prior to implementing clearing or construction activities associated with the UAS airstrip on the north end of Wallops Island.

For those authorizations that have been obtained in conjunction with this EA, their date of approval is listed:

- Section 7 ESA Coordination/Biological Opinion (USFWS); September 22, 2011
- Section 106 of National Historic Preservation Act Coordination (VDHR); January 10, 2011
- Federal Consistency Determination (VDEQ)
- CWA Section 404 Individual Wetland Permit (USACE)
- CWA Section 401 Virginia Water Protection Individual Permit (VDEQ)
- Virginia Stormwater Management Program Permit for Discharge from Construction Activities (VDCR)

CHAPTER 4

MITIGATION MEASURES

CHAPTER 4
MITIGATION AND MONITORING

4.1 MITIGATION

CEQ regulations (40 CFR 1508.20) define mitigation to include: 1) avoiding the impact altogether by not taking a certain action or parts of an action; 2) minimizing impacts by limiting the degree or magnitude of the action and its implementation; 3) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; 4) reducing or eliminating the impact over time by preservation and maintenance operations during the lifetime of the action; and 5) compensating for the impact by replacing or providing substitute resources or environments. Described below are NASA's proposed mitigation measures for implementing the Proposed Action, to construct and operate a new UAS airstrip on north Wallops Island. Mitigation measures are described by resource area.

The UAS airstrip has been designed to avoid to the maximum extent practicable sensitive habitats (i.e., wetlands and uplands) and species.

Biological Resources

WFF prepared a BA for federally listed species known to occur in the project area (Appendix B). Conservation measures were developed and would be implemented to provide protection to these species. Additionally, measures that would be taken for rare species or communities that are not afforded protection under the federal ESA are included. Table 17 summarizes the mitigation measures that would be implemented.

Cultural Resources

In accordance with Section 106 consultation with the VDHR SHPO, measures would be taken to prevent impacts to archeological Site 44AC0089. A temporary fence would be placed around the site to provide a 7.6 m (25 ft) buffer to protect the earthworks from tree and vegetation clearing activities. Clearing activities that may be required within the buffer area would be via hand-clearing tools only with no root extraction. Should it be determined that additional measures to protect the site from vandalism or inadvertent damage are required, WFF would erect a permanent enclosure around the site.

Hazardous Materials and Hazardous Waste Management

MECs may be present at the site of the proposed airstrip. NASA would provide pre-construction awareness training to all persons involved in clearing and construction activities associated with the new UAS airstrip. Little excavation would be anticipated during construction since fill would be required to elevate the airstrip up to 1 m (3 ft) in most areas. Trees and vegetation would be cut at the ground surface; roots would remain in place which would also reduce the potential for discovery or encounter of MECs. In the event that MECs would be encountered, the MEC would be inspected and handled by a trained specialist and properly disposed.

Table 17. Summary of Mitigation Measures to be Taken	
	Mitigation Measure
Loggerhead Sea Turtle – federally listed threatened	UAS would operate infrequently at night; safety lighting at the airstrip would be of minimal intensity and downward-shielded; and overflying UAS would not use running lights.
Piping Plover – federally listed threatened	UAS would overfly the beach eight times per day, at most; UAS operators would be instructed to maintain a flight path both 305 m (1,000 ft) vertically and horizontally away from piping plover nests; and sound levels generated by the loudest UAS would be below ambient sound levels.
Bald Eagle – delisted, protected under the Bald and Golden Eagle Protection Act	A 200 m (660 ft) protective buffer surrounds the bald eagle nest site; this buffer would be maintained. NASA would coordinate monitoring and results with USFWS. If monitoring indicates a potential risk to eagles or aircraft, NASA would work with USFWS and VDGIF to mitigate the risk and/or obtain appropriate permits.
Wetlands	Mitigation would be provided to compensate for all wetland losses. Funds would be donated to the Virginia Aquatic Resources Trust Fund, managed by The Nature Conservancy; NASA has already initiated discussions with The Nature Conservancy to identify suitable mitigation for the proposed impacts.
Cultural Resources	A 7.6 m (25 ft) buffer would be maintained around Site 44AC0089. Clearing activities that may be required within the buffer area would be via hand-clearing tools only with no root extraction.
MEC	All site workers would receive pre construction MEC awareness training. No tree roots would be excavated.
Hazardous Materials	All hazardous materials would be handled in accordance with Federal and State regulations. In case of a spill or release of hazardous material, the WFF Integrated Contingency Plan would be implemented.

4.2 MONITORING

Under NEPA, a federal agency has a continuing duty to gather and evaluate new information relevant to the environmental impact of its actions. Below is a summary of NASA's proposed monitoring of cultural and biological resources during construction/maintenance activities and UAS operations at the new airstrip on north Wallops Island.

Biological Resources

WFF has been monitoring threatened and endangered species at Wallops Island for many years either solely or through partnerships with other agencies, institutions, or research groups. In 2010, the various monitoring efforts were organized into the Wallops Island Protected Species Monitoring Plan. WFF would implement the protocols provided in the Plan which state that, should listed or candidate species (i.e., sea turtles, piping plovers, red knots) or their nests be found on the beach directly under the primary UAS flight paths, UAS operators would be directed to use alternate flight paths, or to temporarily shut down flight operations. In cooperation with USFWS, NASA will undertake a study to assess the impacts of UAV operations on piping plovers and red knots. If the 660 m (1,000 ft) buffer is found to be inadequate, consultation with USFWS would be reinitiated a more effective buffer would be determined.

WFF entered into informal consultation with the USFWS regarding potential impacts to loggerhead sea turtles, piping plover and red knots. After review of NASA's Draft BA, the USFWS stated that "Based on the best available information and in conjunction with this approach, we think that the combination of the 660 m (1,000 ft) buffer and monitoring will avoid and minimize potential effects to plovers, and we are preparing correspondence to complete informal consultation on this plan." However, there are concerns with setting this limit on overflights adjacent to nesting piping plovers (and red knots) as the information on effects of aircraft is either limited or specific to situations or aircraft types, etc. According to the USFWS, "The current research that is being done is focusing primarily on larger and faster military aircraft types like the F-18 and the Osprey, and not the type of aircraft involved in your proposed action. Consequently, conducting monitoring of the effects of the aircraft on plovers, in conjunction with an adaptive management type of approach, would be appropriate to ensure that we address the effects of aircraft." WFF has agreed to prepare and conduct a monitoring plan that would provide information on potential effects on shorebirds. As monitoring provides information on the response of plovers, WFF will work to adopt appropriate modifications to avoidance buffers and flight paths, and will reinitiate consultation under Section 7 of the ESA, if necessary.

Conservation measures presented in the BA for this project and adopted by the USFWS would be implemented.

Cultural Resources

The airstrip clear zones overlap with archeological Site 44AC0089; periodic maintenance within the site would be required to maintain the clear zone. A long-term maintenance plan would be developed by WFF to provide procedures for yearly vegetation removal. The plan would include monitoring Site 44AC0089 for erosion and/or other damage to the earthworks through photo documentation and include provisions for short and long term stabilization techniques and emergency stabilization in the event of natural disasters, including hurricanes.

4.3 ADAPTIVE MANAGEMENT

Adaptive management is a tool to help agencies and organizations make better decisions in a context of uncertainty as more information becomes available. Adaptive management utilizes ongoing data collection and analysis to assess, and if necessary, to modify existing processes. For example, WFF may consider modifying the flight path of UAS or the altitude at which UAS may operate over the beach areas. WFF would consult with interested stakeholders including USFWS prior to implementing or modifying mitigation measures.

CHAPTER 5

CUMULATIVE IMPACTS

CHAPTER 5 CUMULATIVE EFFECTS AND IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

This chapter: 1) defines cumulative effects, 2) describes past, present, and reasonably foreseeable actions relative to cumulative effects, 3) analyzes the incremental interaction the Proposed Action may have with other actions, and 4) evaluates cumulative effects potentially resulting from these interactions.

5.1 CUMULATIVE EFFECTS

CEQ regulations stipulate that the cumulative effects analysis within an EA should consider the potential environmental impacts resulting from "the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions" (40 CFR Part 1508.7). Assessing cumulative effects involves defining the scope of the other actions and their interrelationship with the Proposed Action and alternatives, if they overlap in space and time.

Cumulative effects are most likely to arise when a Proposed Action is related to other actions that occur in the same location or at a similar time. Actions geographically overlapping or close to the Proposed Action and alternatives would likely have more potential for a relationship than those farther away. Similarly, actions coinciding in time with the Proposed Action and alternatives would have a higher potential for cumulative effects.

To identify cumulative effects, three fundamental questions need to be addressed:

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

5.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

The scope of the cumulative effects analysis involves both the geographic extent of the effects and the time in which the effects could occur. Potential impacts of the Proposed Action are generally considered minor, and temporary in nature, and would only occur at WFF's north Wallops Island. For this reason, cumulative effects are only considered for impacts that would occur on or immediately adjacent to north Wallops Island. The temporal boundary is the initial presence of the U.S. government on north Wallops Island (late 1930s) through construction and operation of the UAS airstrip out to 20 years.

Past Activities at North Wallops Island

Activities have occurred on north Wallops Island since its development by the government in the 1930s. Since that time, the Island has been subjected to continuous change and development. By the end of the 1940s, several new access roads and infrastructure had been built. Since the 1940s, changes to the island have included frequent construction, infrastructure upgrades, and removal of structures and facilities driven by technological developments and advances in rocket science and related fields.

In the 1950s, the amount of infrastructure on north Wallops Island expanded notably. Additional launch support infrastructure, new research facilities, and new roads were constructed. Several channels were dredged periodically to accommodate materials sent by boat to the Island. Navy test bombing at the north end of Wallops Island was conducted between 1955 and 1957. Excavation and fill activities to accommodate the expanding mission of WFF continued into the 1970s and 1980s although at a much slower pace than in previous decades. Infrastructure upgrades and some construction took place in the 1990s and 2000s.

Table 18 provides a summary of areas affected at various times on the northern portion of Wallops Island; Figure 15 provides the geographic extent of the cumulative effects analysis area and illustrates the areas affected over the years by activity on north Wallops Island.

Table 18. Summary of Areas Affected by Various Actions at North Wallops Island in ha (ac)

Year	*Wetland Drainage*	*Wetland Fill*	*Impervious Surface*	*Miscellaneous Habitat Impacts*	*Total Disturbance*
1938	11.5 (28.5)	0	0.07 (0.18)	0.73 (1.8)	12.33 (30.48)
1949	0	0	0.018 (0.044)	6.37 (15.75)	6.39 (15.79)
1957	0	0	0.016 (0.039)	9.19 (22.7)	9.21 (22.74)
1966	0	0.16 (0.39)	9.56 (23.63)	14.75 (36.44)	24.47 (60.46)
1974	0	0	0	5.26 (13.0)	5.26 (13.0)
1979	0	0	0.010 (0.02)	0.22 (0.55)	0.23 (0.57)
1988	0	0	0	1.52 (3.75)	1.52 (3.75)
1994	0	0	0	0.4 (1.1)	0.4 (1.1)
2010	0	0	0.30 (0.75)	0.6 (1.5)	0.90 (2.25)
2010+	0	0	6.2 (15.2)	0	6.2 (15.2)
Total	**11.5 (28.5)**	**0.16 (0.39)**	**16.17 (39.86)**	**39.04 (96.59)**	**66.91 (165.34)**

Note: Totals may not add up exactly when compared to specific values in each cell due to rounding. It should also be noted that the figures presented in Table 18 are only estimates of impacts, and were based upon interpretation of aerial photographs, some of which were very old. As such, these estimates are only "ballpark" figures, and should only be used for drawing general conclusions.

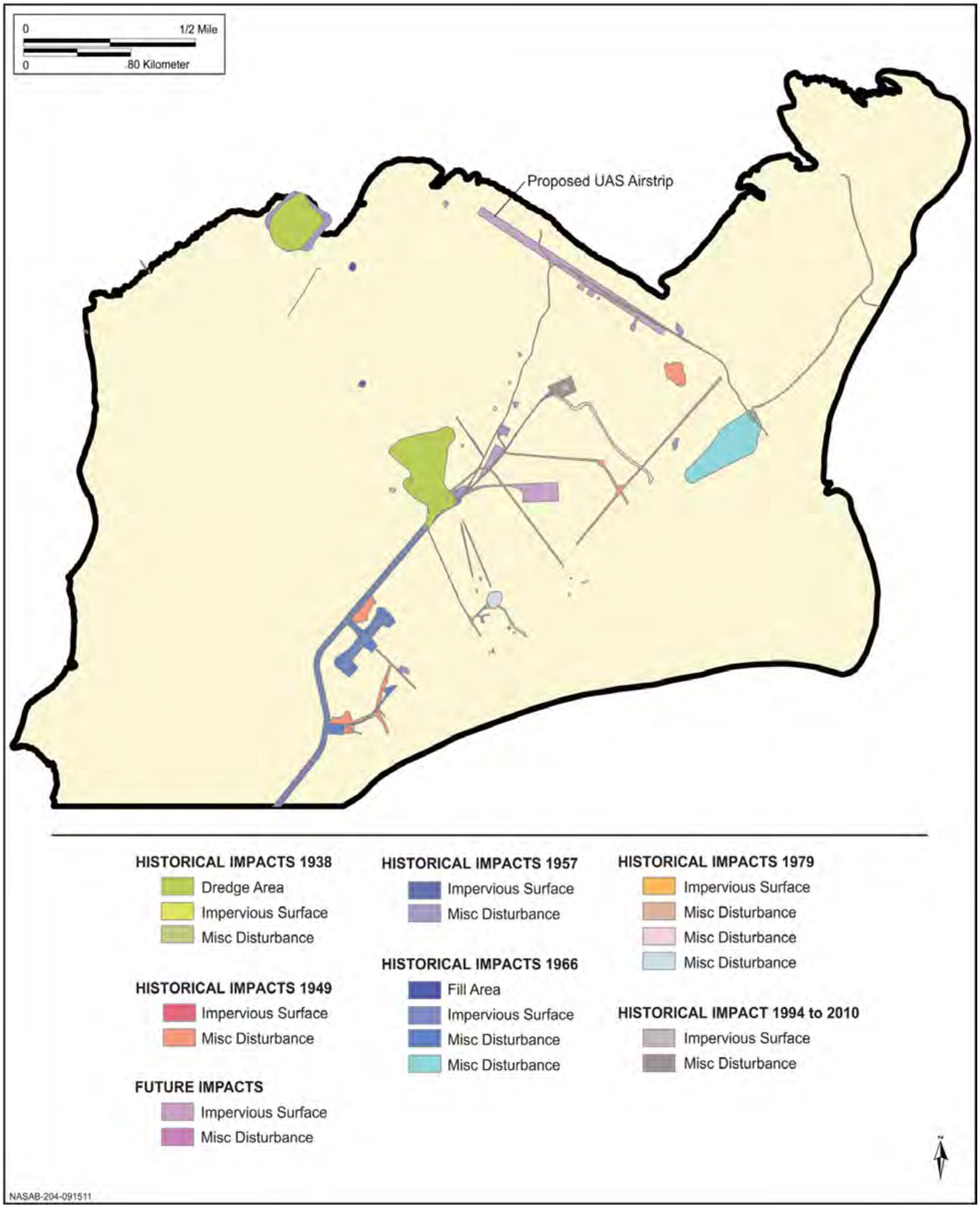

Figure 15. Geographic Extent of the Cumulative Effects Analysis Area with Historic Impacts

Present and Reasonably Foreseeable Future Activities and Projects

Present Activities

Range Operations - NASA can currently launch up to 108 rockets a year from the launch areas on Wallops Island. These include a maximum of 60 from the Sounding Rocket Program, 12 from orbital rocket missions at Pad 0-B, 6 from orbital rocket missions at Pad 0-A, and 30 from Navy missiles and drones (NASA 2005a, NASA 2009a).

NASA conducts routine activities including repairs and maintenance of existing infrastructure such as grounds, roads, buildings, and utilities on a regular basis to ensure the ongoing operation of the facility. Additionally, NASA conducts the following activities:

- UAS flights from the south Wallops Island Airstrip
- Piloted flights from WFF Main Base
- Launching autonomous underwater vehicles
- Assembling and transporting payloads
- Rocket boosted projectile testing

Beach Nourishment - A Record of Decision for NASA's Shoreline Restoration and Infrastructure Protection Program (SRIPP) PEIS was signed in December 13, 2010 (NASA 2010b). NASA will implement the actions analyzed in the SRIPP PEIS (i.e., southerly seawall extension and construction of an approximately 30 m [100 ft] wide beach along 6 km [3.7 mi] of the shoreline) beginning in late 2011. The project will have a 50-year design life; the need for regularly scheduled beach re-nourishment is a key component of the project and is discussed below under ***Future Projects***.

Future Projects

Construction and Demolition - WFF would implement several demolition and construction projects on north Wallops Island during the period between 2012 and 2017. These projects include the demolition of the 740 m^2 (8,000 ft^2) V-67 Rocket Motor Storage Building with subsequent construction of a Payload Processing Facility in its footprint. The Rocket Motor Storage Facility would be re-located to the site of the Wallops Island helicopter pad, approximately 1 km (0.6 mi) southwest of its current location.

Channel Dredging - WFF is also proposing to conduct maintenance dredging in the navigation channel between the Main Base boat basin at the Visitor Information Center and the Wallops Island boat basin located west of the Coast Guard Lifesaving Station. Although no funding has yet been identified for this effort, WFF would readily pursue this project should the need present itself in the future (for example, from a large flight article requiring deepwater barge transport). It would most likely involve the use of a mechanical dredge with upland placement of the dredged material. Based upon previous review of the dredged sediments by NASA, the dredged material is expected to be mostly silty material unsuitable for re-use or placement on nearby beaches. The dredged materials would be placed in a confined upland site for de-watering. The exact locations for the placement of these materials are to be determined. It is anticipated that approximately 380,000 cubic meters (m^3) (500,000 cubic yards [cy]) of material would be removed initially with up to 190,000 m^3 (250,000 cy) dredged on a five-year maintenance cycle.

Beach Re-nourishment - As part of its SRIPP, a 5 to 7 year re-nourishment cycle for the Wallops Island beach is planned. Accordingly, over the next 20 years, approximately 3-4 re-nourishment activities may occur. As a component of re-nourishment, NASA may remove sand, as needed, from the north end of Wallops Island and bring it to the south end of the Island. Prior to moving sand from north Wallops Island to the south, additional NEPA analyses would be performed. To mitigate potential direct impacts to listed species, NASA would only excavate sand for future re-nourishment outside of piping plover and sea turtle nesting seasons.

These projects have the potential to result in negligible short-term impacts to air quality; water quality; biological resources; hazardous materials, hazardous systems, and hazardous waste management; socioeconomics; and transportation. Negligible to very minor short-term impacts to these resources from implementing the UAS construction project would be likely; however, no long-term cumulative impacts to these resources would be anticipated. Negligible, cumulative, long-term impacts to wetlands may be anticipated from these projects.

Projects and Actions by Others

There are ongoing and reasonably foreseeable offshore projects that have been considered in evaluating cumulative effects on resources within the region.

Federal Navigation Projects -The USACE occasionally dredges the navigation channel in Bogues Bay, approximately 3 km (1.8 mi) southwest of the north UAS airstrip project site. Engineering estimates suggest that approximately 14,000 m^3 (18,000 cy) of fine sand and silt material could be removed every 10 years (Waterway Surveys and Engineering 1987). Although USACE has not dredged the channel recently, and NASA is unaware of available funding for this project, the potential exists for dredging to occur with the next 20 years, therefore it is considered in the cumulative effects analysis. The disposal site for this project is a bermed area 0.8 km (0.5 mi) south of the northernmost part of the channel and is thus outside of the analysis area.

Additionally, USACE routinely dredges the Chincoteague Inlet (just north of Wallops Island) to maintain channel depth. Occurring on a nearly annual basis, this Federal navigation project typically removes 60-76,000 m^3 (80-100,000 cy) from the channel and places the material in the Atlantic Ocean east of Wallops Island.

Public Recreation – Although Wallops Island is closed to public access, the adjacent waterways and marshes to the north and west are regularly used by the public for activities such as boating, waterfowl hunting, fishing, and harvesting shellfish. Details regarding level and frequency of use are not available; however it is assumed that most of these activities take place year-round, with hunting only taking place during fall and winter months.

The potential for cumulative impacts to airspace management; safety; or hazardous materials, hazardous systems, and hazardous waste management under the Proposed Action, when considered with ongoing activities in the analysis area would be negligible. No short- term or long-term cumulative impacts to these resource areas would be anticipated.

5.3 POTENTIAL CUMULATIVE EFFECTS BY RESOURCE

The following section addresses those resources that have been identified as having the potential to be affected from the incremental effects of the UAS Airstrip proposal in combination with past actions and the present and reasonably foreseeable projects and activities described in Section 5.2. A summary of the resource areas with potential cumulative impacts are listed in Table 19. Those resources areas presented in Table 19 are deemed to have negligible impacts, thereby not warranting detailed discussion. Those resources meriting additional discussion are presented after Table 19.

Table 19. Summary of Resource Areas with Potential Cumulative Impacts from Implementation of the Proposed Action

Resource	*Potential Cumulative Impact*	*Type of Impact*
Airspace Management	Negligible	Increased UAS operations could impact other users of R-6604 A/B; coordination with WFF Range Control Center or the Washington ARTCC, if required, would result in negligible impacts
Safety	Negligible	Ground and flight safety risks increase with an increase in UAS operations; safety measures to ensure ground and flight safety would continue to be observed resulting in negligible impacts
Noise	Negligible	Noise from UAS airstrip construction would be minor, temporary, and localized; noise from UAS operations would remain below ambient sound levels
Topography and Soils	Negligible	Modifications to grade and off-site fill would change the topography and soil composition; however, the overall impact would be negligible
Cultural and Traditional Resources	Negligible	Placement of a buffer around a known archeological site; adverse impacts would be unlikely
Land Use, Visual, and Recreation Resources	Negligible	Tree and vegetation removal; impact would be localized and likely not visible from the water recreation areas
Air Quality	Negligible	Short-term impacts during construction; increased UAS operations above current levels would have an imperceptible impact on air quality in the long-term
Water Quality	Negligible	Short-term impacts from turbidity and erosion during construction may be further impacted during dredging projects; however best management practices would decrease sedimentation and erosion.
Hazardous Materials, Hazardous Systems, and Hazardous Waste Management	Negligible	General increase in all hazardous materials with increased UAS operations; standard safety procedures would continue to be followed with no adverse impact expected
Socioeconomics	Negligible	Influx of personnel during UAS test and research operations would provide a small however negligible economic impact to the local area
Transportation	Very Minor	Short-term increase in local area traffic during construction phases; long-term adverse impacts would not be anticipated

Note: Negligible refers to impacts that would be so small that when studying the larger effect, the impacts would be essentially overlooked.

Biological Resources

Wildlife (Focusing on Avian Resources)

Locational Changes in Suitable Beach Nesting Habitat

As a result of implementing the SRIPP, there may be onshore impacts for beach nesting and foraging birds that could include startling, crushing eggs by motorized vehicles, and reduction in prey base along the newly created shoreline. Excavating sand from north Wallops Island would also lower the beach elevation, possibly resulting in a higher risk of flooding to shorebird nests. However, it is expected that the newly created beach at the south end of the island would result in a substantial amount of new shorebird nesting and foraging habitat where there currently is none; this represents an overall net beneficial effect for shorebirds using either the northern or southern beaches of Wallops Island.

Cumulative Noise

Avian nesting on the northern end of Wallops Island is not expected to be measurably affected by UAS operational noise; however during construction elevated noise levels may startle birds in the vicinity of the project site. Temporary increases in noise are anticipated as a result of current and planned onshore projects in the cumulative effects analysis area. An interruption of foraging and nesting activities for avian species may occur as a result of launch and static fire testing activities proposed for the Expansion of the WFF Launch Range project, the existing UAS airstrip, or from existing WFF launch range activities; these impacts would be temporary. Noise generated from rocket launches is generally low-frequency, of short duration, and occurs infrequently. Naturally occurring background noises in the existing and potential nesting areas, such as wave action and thunderstorms, are more frequent and of longer duration than noise from a rocket launch. Regarding navigation channel dredging west of Wallops Island, marsh nesting and foraging birds could be temporarily disturbed by noise generated during dredging operations. Noise associated with motorized watercraft use has the potential to startle birds that would most likely initiate a temporary flee response. Rodgers and Schwikert (2002) reported average flush distances for waterbirds ranging between approximately 20 and 60 m (65 – 200 ft) from the vessel, depending upon species. Bratton (1990) found that foraging and resting wading birds located in *Spartina*-dominated tidal creeks (in an environment similar to west Wallops Island) were more sensitive to vessel related disturbance than those along the edges of larger bodies of water. However, vessel traffic in the analysis area is not heavy, the stimulus would be temporary, and it is expected avian activity would return to normal shortly following vessel passage. In summary, no long-term changes to ambient noise levels are anticipated.

Cumulative Motorized Vehicle Impacts

In the event the newly created beach on Wallops Island becomes suitable habitat for shorebirds, indirect cumulative effects on nesting shorebirds may occur from security patrols. Motorized vehicle use on beaches is a threat to piping plovers, as well as other shorebirds that nest on beaches and dunes. Vehicles can crush eggs, adults, and chicks (Burger 1987). Continued recreational use of the Wallops Island beach could also present unintended adverse effects (direct mortality or harassment) on nesting shorebirds including piping plovers. Pedestrians may flush incubating plovers from nests (Flemming et al. 1988), exposing eggs to predators or excessive temperatures. Repeated exposure of eggs on hot days may cause overheating, rendering the embryos unviable (Bergstrom 1991); excessive cooling may kill embryos or retard their development, delaying hatching dates (Welty 1982). Pedestrians can also disturb unfledged chicks (Burger 1994), driving them from preferred habitats, decreasing available foraging time, and causing expenditure of energy. However, with NASA's commitment to ongoing biological monitoring along the Wallops Island shoreline during nesting season (described in more detail below), nests would be identified and clearly demarcated such that the potential for unintended adverse effects would be minimal.

Increased Predation Rates on Nests

Indirect effects to shorebirds are likely to include an increased predation rate due to human activity on the beach. Human activity may result in litter on the ground, which could attract predators due to increased food availability. The increased numbers of predators may increase risk of disturbance, nest loss, and adult mortality of plovers and increase losses of sea turtle eggs and nests. Gulls, foxes, and raccoons can also be a major source of loss of eggs and juvenile plovers. WFF employs a variety of techniques to reduce predation on nesting shorebirds. The use of predator exclosures (fences around nests) has been successful in reducing predation on piping plover eggs (Melvin et al. 1992). However, these devices provide no protection for mobile adults or piping plover chicks, which generally leave the exclosure within a day of hatching and move extensively along the beach to feed. To reduce the risks of predation to nesting shorebirds and sea turtles on the Wallops Island beach, WFF employs biologists from USDA Wildlife Services who routinely perform predator removal.

Effects from Climate Change and Loss of Overwash Areas

Overall sea-level rise from climate change that is expected to continue would likely cause the natural barrier islands along the Delmarva coast to retreat inland and therefore reduce the amount of island area and consequentially reduce shorebird habitat area. This habitat modification due to sea-level rise would not occur to the same degree on Wallops Island because of the SRIPP thus cumulative effects of sea-level rise may have less of an impact on Wallops Island compared to the other barrier islands along the Delmarva coast. According to Wilke et al. (2008), overwash events are documented as one of the primary causes of nest loss for American Oystercatchers. An increase in the frequency of these events could lead to low rates of reproductive success, which would be insufficient to maintain a stable population. Moreover, Boettcher et al. (2007) states "one of the major impending threats facing piping plovers and other beach nesting species is an increase in the frequency of beach flooding as a result of global climate change and sea-level rise, which may lead to chronic reproductive failure and eventual loss of breeding habitat." Sea-level rise of approximately 0.5 m (1.5 ft) over the 50-year analysis time frame would also flood portions of the tidal marshes west of Assateague, Wallops, and Assawoman Islands. Marsh nesting species would be most severely affected as rising water levels would likely result in more flooding and reduced nesting success (Erwin et al. 2006). Erosion of marsh islands may further reduce availability of preferred nesting sites, potentially resulting in selection of alternative nesting sites.

Continued Special Status Species Monitoring and Reporting

To mitigate adverse effects on protected species from all impact-producing factors, NASA would continue to coordinate with USFWS and USDA personnel in monitoring the Wallops Island beach for piping plover and sea turtle activity. Any nests discovered would be appropriately marked with a global positioning unit and identified with signage. Areas designated as recreational use beach would be modified based upon piping plover and sea turtle nesting activity. Furthermore, the security contractor at WFF is in the process of installing a closed circuit monitoring system to allow surveillance from a central location. Upon completion of the closed circuit system, beach patrols are expected to decrease. As such, impacts to all listed species on the beach as a result of security patrols would likely diminish over time. Additionally, WFF Environmental Office staff would continue its outreach program to all users of the beach, including security staff and recreational users. Elements of the outreach program include installation of signage at all beach access points and development and dissemination of fact sheets, both of which contain information regarding the listed species that may be on the beach and the appropriate reporting protocol if the presence of a species is suspected.

Vegetation

The Proposed Action would result in the loss of 3.26 ha (8.05 ac) of uplands. The loss of the uplands would be a long-term impact; however, no present or known future projects on north Wallops Island would result in the loss of additional upland habitat and as such cumulative impacts would not be anticipated. The Proposed Action would result in the loss of 1.0 ha (2.47 ac) of non-tidal wetland habitat. No present or reasonable foreseeable future projects on Wallops Island would result in the loss of non-tidal wetland habitat. The loss of this small amount of non-tidal wetland habitat, under the Proposed Action would present an adverse cumulative impact; however, the impact would be minor.

Previous disturbances within the analysis area have caused extensive invasion of common reed, particularly to the south of the project area. Some additional spread of common reed may be anticipated due to the construction of the UAS Airstrip. Additionally, the dredged material from channel maintenance could likely become invaded. However, NASA would employ USEPA-approved chemical and/or mechanical methods such as mowing to limit the spread of common reed. NASA would also continue to cooperate with DCR in efforts to monitor and improve common reed control methods.

Wetlands

The cumulative impacts analysis for this resource centers on wetlands; the geographic scope includes wetlands on north Wallops Island. The focus is palustrine (non-tidal) wetlands as no tidal wetlands are affected by the Proposed Action. Based on interpretations of aerial photographs, approximately 11.7 ha (28.9 ac) of wetlands were affected by drainage or fill activities on north Wallops Island between 1938 and the 1966 (refer to Table 18). These impacts occurred prior to the enactment of the CWA in 1972 and were therefore not likely regulated or mitigated. The Proposed Action would have the potential to affect a total of 1.0 ha (2.47 ac) of non-tidal wetlands. This would represent a long-term impact; however, WFF has compensated for more wetlands impacts than have occurred in the recent past for activities outside of the geographic scope of this proposal. WFF would continue to strive to identify areas to compensate for future wetland impacts through consultation with other resource agencies regarding avoidance, minimization, and mitigation measures. As such, the effects of future WFF actions are not likely to be substantial.

Water Quality

Wetlands improve water quality by trapping sediments, reducing turbidity, restricting the passage of toxics and heavy metals, decreasing biological oxygen demand, and trapping nutrients. Loss of these resources over time has likely contributed to a minor to moderate long-term adverse effect on water quality within the analysis area.

Additionally, construction activities including grading, clearing, filling, and excavation for the future projects would result in disturbance of the ground surface and would have the potential to cause soil erosion and the subsequent transport of sediment or nutrients into waterways via stormwater. NASA has and would continue to minimize impacts on surface waters by acquiring construction and industrial Virginia Storm Water Management Program permits and by developing and implementing a site-specific Storm Water Pollution Prevention Plan and Erosion and Sediment Control plans prior to land-disturbing activities. NASA would follow Virginia Storm Water Management Program requirements for proper sizing and planning for stormwater conveyance from new infrastructure.

Other projects occurring in adjacent marine waters (i.e., dredging) would also result in temporary elevated levels of turbidity, particularly for the two projects in the “back bays” west of Wallops Island. However, these projects would be temporally and spatially separated and would result in negligible cumulative impacts on water quality. NASA would ensure that all dredged material placement sites are appropriately diked such that dewatering of material would have minimal effects on adjacent waterways.

5.4 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

NEPA requires that environmental analysis include identification of any irreversible and irretrievable commitment of resources which would be involved in the Proposed Action should it be implemented. Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects this use could have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action (e.g., extinction of a threatened or endangered species or the disturbance of a cultural resource).

Energy typically associated with construction activities would be expended and irretrievably lost under the Proposed Action. Fossil fuels used during transportation of construction materials (e.g., fill, concrete/asphalt, and mobilization of equipment to the site) and the operation of construction equipment would constitute an irretrievable commitment of fuel resources. Energy would also be expended and irretrievably lost under the Proposed Action during UAS operations. Fossil fuels used during transportation of the UAS and operational support vehicles to the airstrip and the operation of the UAS would constitute an irretrievable commitment of fuel resources.

CHAPTER 6

REFERENCES CITED

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CHAPTER 7

AGENCIES AND PERSONS CONSULTED

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AGENCIES AND PERSONS CONSULTED

Table 20 provides the recipients of the coordination letter and draft EA. Coordination letters were mailed July 14, 2010. Appendix A provides the coordination letter and responses that were received.

Table 20. Recipients of Coordination Letter and Draft EA

Point of Contact	*Agency/Organization*	*Letter*	*Draft EA*
Federal Agencies			
Mr. David O'Brien	National Marine Fisheries Service, Habitat Conservation Division	✓	✓
Ms. Julie Crocker	National Marine Fisheries Service, Protected Resource Division	✓	✓
Ms. Trish Kicklighter	National Park Service, Assateague Island National Seashore	✓	✓
Mr. Doug Crawford	National Oceanic and Atmospheric Administration	✓	✓
Mr. Steve Gibson	U.S. Army Corps of Engineers, Eastern Shore Field Office	✓	✓
Ms. Barbara Rudnick	U.S. Environmental Protection Agency, Region III	✓	✓
Ms. Cindy Schulz	U.S. Fish and Wildlife Service, Virginia Field Office	✓	✓
Mr. Lou Hinds	U.S. Fish and Wildlife Service, Chincoteague National Wildlife Refuge	✓	✓
Dr. Marilyn Ailes	U.S, Navy, Surface Combat Systems Center	✓	✓
LT Marc Merriman	U.S. Coast Guard, Chincoteague Group	✓	✓
CDR John J. Keegan	U.S. Navy, Surface Combat Systems Center	✓	✓
CAPT James R. Boorujy	U.S. Navy, U.S. Fleet Forces Command	✓	✓
State Agencies			
Mr. Richard Baldwin	Mid-Atlantic Regional Spaceport	✓	✓
Ms. Ellie Irons	Virginia Department of Environmental Quality, Office of Environmental Impact Review	✓	✓
Ms. Ruth Boettcher	Virginia Department of Game and Inland Fisheries	✓	✓
Ms. Amanda Lee	Virginia Department of Historic Resources	✓	✓
Mr. George Badger	Virginia Marine Resources Commission	✓	✓
Ms. Rene Hypes	Virginia Department of Conservation and Recreation, Natural Heritage Program	✓	✓
Mr. Frank Daniel	Virginia Department of Environmental Quality, Tidewater Regional Office	✓	✓
Ms. Deanna Beacham	Virginia Council on Indians	✓	✓
Local Government			
Mr. Steven B. Miner	Accomack County	✓	✓
Ms. Grayson C. Chesser	Accomack County Board of Supervisors	✓	✓
Ms. Laura Belle Gordy	Accomack County Board of Supervisors	✓	✓
Ms. Wanda Thornton	Accomack County Board of Supervisors	✓	✓
Mr. Ronald S. Wolff	Accomack County Board of Supervisors	✓	✓
Mr. David Fluhart	Accomack County Wetlands Board	✓	✓
Ms. Kathy Phillips	Assateague Coastal Trust	✓	✓
Ms. Suzanne Taylor	Chincoteague Chamber of Commerce	✓	✓
Mr. Robert G. Ritter	Town of Chincoteague	✓	✓
Mayor John H. Tarr	Town of Chincoteague	✓	✓

Table 20. Recipients of Coordination Letter and Draft EA (con't)			
Point of Contact	***Agency/Organization***	***Letter***	***Draft EA***
Other Organizations and Individuals			
Mr. Nick Olmsted	BaySys Technologies, Inc.	✓	✓
Mr. Denard Spady	Citizens for a Better Eastern Shore	✓	✓
Dr. Bryan Watts	College of William and Mary, Center for Conservation Biology	✓	✓
Mr. Jim Rapp	Delmarva Low-Impact Tourism Experiences	✓	✓
Mr. Peter Bale	Eastern Shore Defense Alliance	✓	✓
Ms. Jean Hungiville	Eastern Shore of Virginia Chamber of Commerce	✓	✓
Ms. Donna Bozza	Eastern Shore Tourism Commission	✓	✓
Ms. Amber Parker	Marine Science Consortium	✓	✓
Ms. Mary A. Elfner	National Audubon Society, Virginia Important Bird Areas	✓	✓
Mr. Joseph Fehrer	The Nature Conservancy, MD/DC Chapter	✓	✓
Mr. Stephen Parker	The Nature Conservancy, Virginia Coast Reserve	✓	✓
Mr. Randy Fox	Trails End Campground	✓	✓
Dr. Karen J. McGlathery	Virginia Coast Reserve Long-Term Ecological Research Project	✓	✓
Mr. David Burden	Virginia Eastern ShoreKeeper	✓	✓
Federal and State Elected Officials			
Del. Lynwood W. Lewis	Virginia House of Delegates	✓	✓
Sen. Ralph Northam	Virginia Senate	✓	✓

CHAPTER 8

LIST OF PREPARERS AND CONTRIBUTORS

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LIST OF PREPARERS AND CONTRIBUTORS

NAME	TITLE	AREA OF RESPONSIBILITY
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Joel Mitchell	Natural Resources Program Manager	Document Review
Shari Silbert	URS, WFF Environmental Scientist	Document Review
USACE		
Steve Gibson	Environmental Scientist	Document Review

generator for mobile ops center
fuel

UAS ops — 1040 flights per year total

Model	Engine (HP) Rating	[1]annual # flights	flight time in hours	[2]BSFC lb/hp-hr	[3]VOC lb/hp-hr	CO lb/hp-hr	[3]NOx lb/hp-hr	[3]PM lb/hp-hr	[4]CO2 g/hp-hr	VOC lb	CO lb	NOx lb	PM lb	CO2 lb
Viking 100	16	130	12	0.408	0.000966	0.004764	0.00978836	0.000588	188	9.83	48.52	99.68	5.98	4220.84
Viking 300	25	130	9	0.408	0.000966	0.004764	0.00978836	0.000588	188	11.52	56.86	116.81	7.01	4946.30
Viking 400	38	130	10	0.408	0.000615	0.003378	0.01042329	0.000747	188	12.39	68.09	210.08	15.06	8353.75
Exdrone	8	130	2	0.408	0.0016817	0.009067	0.011529796	0.0009864	188	1.43	7.69	9.78	0.84	351.74
Shadow 200	38	130	4	0.408	0.000615	0.003378	0.01042329	0.000747	188	4.96	27.24	84.03	6.02	3341.50
		turbofan 757 engines rated output scaled to			[5]VOC	[5]CO	[5]NOx	[5]PM	[6]CO2	VOC	CO	NOx	PM	CO2
	GTM AirSTAR	5.5% in kN	# engines	[1]annual # flights	g/kN	g/kN	g/kN	g/kN	g/kN	lb	lb	lb	lb	lb
	average flight	9.5978	2	130	3.23	33.6	51.6	11.6	NA	17.77	184.85	283.88	63.82	NA
Grand Total in Tons/yr for All Flight Ops										**0.03**	**0.20**	**0.40**	**0.05**	**10.61**
										CO2 in metric tons (CO2*e*)				**9.6**

[1]Total number of flights per year/number of aircraft that may fly (1040/8) - includes battery operated aircraft (2)

[2]Brake Specific Fuel Consumption

[3]From Table A-4 of Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition, EPA, July 2010.

[4]Converted from emission factor for Distillate Fuel Oil #2 (diesel) as listed in Table C-1 to Subpart C of Part 98 Default CO2 Emissions Factors and High Heat Values for Various Types of Fuel.

Listed factor 73.96 kg CO2/mmBtu
393 hp-hr = mmBtu
188 g CO2/hp-hr

[5]Averaged and scaled EFs from ICAO Engine Emissions Databank Datasheets for engines PW2037 and PW2040 (common 757 engine models)(could find no data on the scaled engines).

[6]Scaled EF from Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, Sect 2.5, Table 2, IPCC, 2001.

Operational Emissions - Mobile Generators Assume 60kW generators used for all mobile control centers

Generator size HP	hours of operation	BSFC lb/hp-hr	[1]CO lb/yr	[1]NOx lb/yr	[1]PM lb/yr	[1]VOC lb/yr	CO2 lb/yr
80.46	15210	0.408	3475	15479	360	7490	539,263
	Tons/yr		**1.74**	**7.74**	**0.18**	**3.74**	**269.63**
			CO2 in metric tons (CO2*e*)				**244.6**

Pollutant	Emission Factors Diesel Fuel [a, b] lb/hp-hr
CO	0.00696
NO_x	0.031
PM	0.00072
VOC	0.015
CO2	1.08

[a] Emission factors used to estimate emissions from the consumption of diesel fuel from AP-42, Section 3.3, Table 3.3-1, EPA 1996.

[b] Emission factors from From Table A-4 of Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition, EPA, July 2010.

	VOC	CO	NOx	PM	CO2
Total Annual Operation Emissions/Year in Tons	**3.79**	**1.77**	**7.94**	**0.58**	**280.24**
	CO2 in metric tons (CO2*e*)				**254**