Final

Wallops Island Northern Development

Environmental Assessment

Prepared for

National Aeronautics and Space Administration

Goddard Space Flight Center

Wallops Flight Facility

Wallops Island, VA

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ACRONYMS AND ABBREVIATIONS

AADT	Annual Average Daily Traffic
ac	acre
AFTT	Atlantic Fleet Training and Testing
ANEC	A&N Electric Corporation
APE	Area of Potential Effect
ASV	Autonomous Surface Vehicle
AUV	Autonomous Underwater Vehicle
BCC	Birds of Conservation Concern
BGEPA	Bald and Golden Eagle Protection Act
bgs	below ground surface
BMP	Best Management Practice
BO	Biological Opinion
CEA	Cumulative Effects Analysis
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cm	centimeter
CWA	Clean Water Act
CZM	Coastal Zone Management
dB	decibel
dBA	A-weighted decibel
DMCF	Dredged Material Containment Facility
DoD	U.S. Department of Defense
DPS	Distinct Population Segments
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ELV	Expendable Launch Vehicle
EO	Executive Order
ESA	Endangered Species Act
ESC	Erosion and Sediment Control
FAA	Federal Aviation Administration
FCD	Federal Consistency Determination
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
Final Site-wide PEIS	NASA WFF Site-Wide Programmatic Environmental Impact Statement
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
ft	foot/feet
ft^2	square foot/feet
FUDS	Formerly Used Defense Site
FY	Fiscal year
GARFO	Greater Atlantic Regional Fisheries Office

GISS	Goddard Institute for Space Studies
ha	hectare
HAPC	Habitat Areas of Particular Concern
Hz	hertz
ICP	Integrated Contingency Plan
ILF	In-Lieu Fee
in	inch
JPA	Joint Permit Application
kg	kilogram
kHz	kilohertz
km	kilometers
lb	pound
LFIC	Liquid Fueled Intermediate Class
LV	Launch Vehicle
m	Meter
m^2	square meters
m^3	cubic meters
MARAD	Maritime Administration
MARS	Mid-Atlantic Regional Spaceport
MBTA	Migratory Bird Treaty Act
MEC	Munitions and Explosives of Concern
mg/L	milligrams per liter
mi	miles
MLLW	Mean Lower Low Water
MMPA	Marine Mammal Protection Act
MMRP	Military Munitions Response Program
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSL	mean sea level
NASA	National Aeronautics and Space Administration
NAVD88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Action
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NOTMAR	Notice-to-Mariner
NRHP	National Register of Historic Places
NWR	National Wildlife Refuge
OSHA	Occupational Health and Safety Administration
Pa	Pascal
PEIS	Programmatic Environmental Impact Statement
PTS	permanent threshold shift
RTLS	return to launch site
SAF	Simplified Attenuation Formula
SEL	sound exposure level

SERP	Shoreline Enhancement and Restoration Project
SFHC	Solid Fueled Heavy Class
SHPO	State Historic Preservation Office
SOP	standard operating practice
SPL	sound pressure level
SR	State Road
SRIPP	Shoreline Restoration and Infrastructure Protection Program
STEM	Science, Technology, Engineering, and Math
SWPPP	Stormwater Pollution Prevention Plan
TSS	Total suspended sediment
U.S.	United States
U.S.C.	United States Code
UAS	Unmanned Aircraft Systems
UGS	Unmanned Ground Systems
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife
UXO	Unexploded Ordnance
VAC	Virginia Administrative Code
VARTF	Virginia Aquatic Resources Trust Fund
V-CRIS	Virginia Cultural Resource Information System
VCSFA	Virginia Commercial Space Flight Authority
VDCR	Virginia Department of Conservation and Recreation
VDEQ	Virginia Department of Environmental Quality
VDHR	Virginia Department of Historic Resources
VDOT	Virginia Department of Transportation
VDWR	Virginia Department of Wildlife Resources
VMRC	Virginia Marine Resources Commission
VSMP	Virginia Stormwater Management Program
WFF	NASA Goddard Space Flight Center’s Wallops Flight Facility
yd^3	cubic yards
µPa	microPascal

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1 Purpose and Need for Action

1.1 Introduction

The National Aeronautics and Space Administration (NASA) has prepared this Tiered Environmental Assessment (EA) in accordance with the National Environmental Policy Act of 1969 (NEPA) to analyze potential impacts on the environment resulting from proposed infrastructure developments on the north end of Wallops Island (the Project). The EA Project Area is located within the NASA Goddard Space Flight Center's Wallops Flight Facility (WFF) in Accomack County, Virginia (**Figure 1-1**).

This Project would ultimately establish a new facility at Wallops Island on the United States (U.S.) Department of Transportation's Maritime Administration (MARAD) "Marine Highway Program's" M-95 Marine Highway, which is among several Marine Highway corridors designated around the U.S. to encourage the expanded use of America's navigable waters. The proposed infrastructure developments associated with the Project would provide a port and operations area, including enhanced operational capabilities for NASA and the Mid-Atlantic Regional Spaceport (MARS). The Virginia Commercial Space Flight Authority (VCSFA), through MARS, operates launch pads and the north island Unmanned Aerial Systems (UAS) Airstrip, as a tenant on NASA's Wallops Island.

This EA is tiered from the May 2019 *NASA WFF Site-Wide Programmatic Environmental Impact Statement (Final Site-wide PEIS;* NASA 2019a), in which NASA evaluated the environmental consequences of constructing and operating new facilities and infrastructure at WFF. In accordance with the Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] 1502.20), actions associated with the Proposed Action in the *Final Site-wide PEIS* may be tiered from that document by incorporating the *Final Site-wide PEIS* by reference, thereby eliminating duplicate discussions.

The Project Area would be located at, and in the vicinity of, the MARS UAS Airstrip on the north end of Wallops Island (**Figure 1-2**). The Project being evaluated by this EA consists of the following specific actions:

- Channel dredging (vessel approach channel and turning basin);
- Construction of a new pier for barge access and berthing;
- Construction of a second hangar at the UAS Airstrip;
- Installation of new utility infrastructure;
- Installation of new airstrip lighting and hardening/reinforcement of a section of runway;
- Improvements/upgrades to the existing UAS Airstrip access road;
- Construction of a new pier access road (with utility bank) adjacent to the UAS Airstrip;
- Construction of a new project support building; and
- Construction of a new vehicle parking lot.

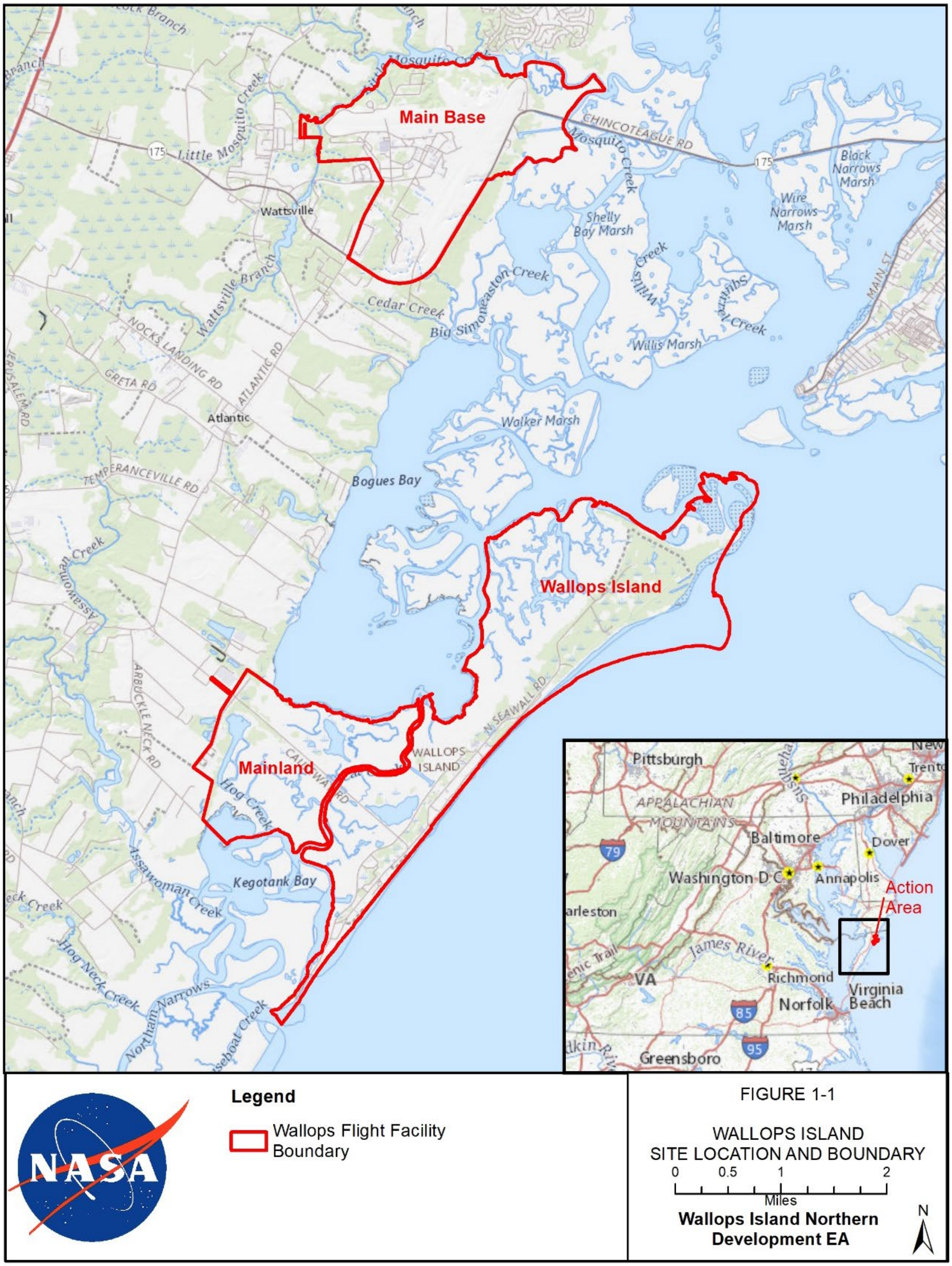

Figure 1-1. Wallops Island Site Location and Boundary

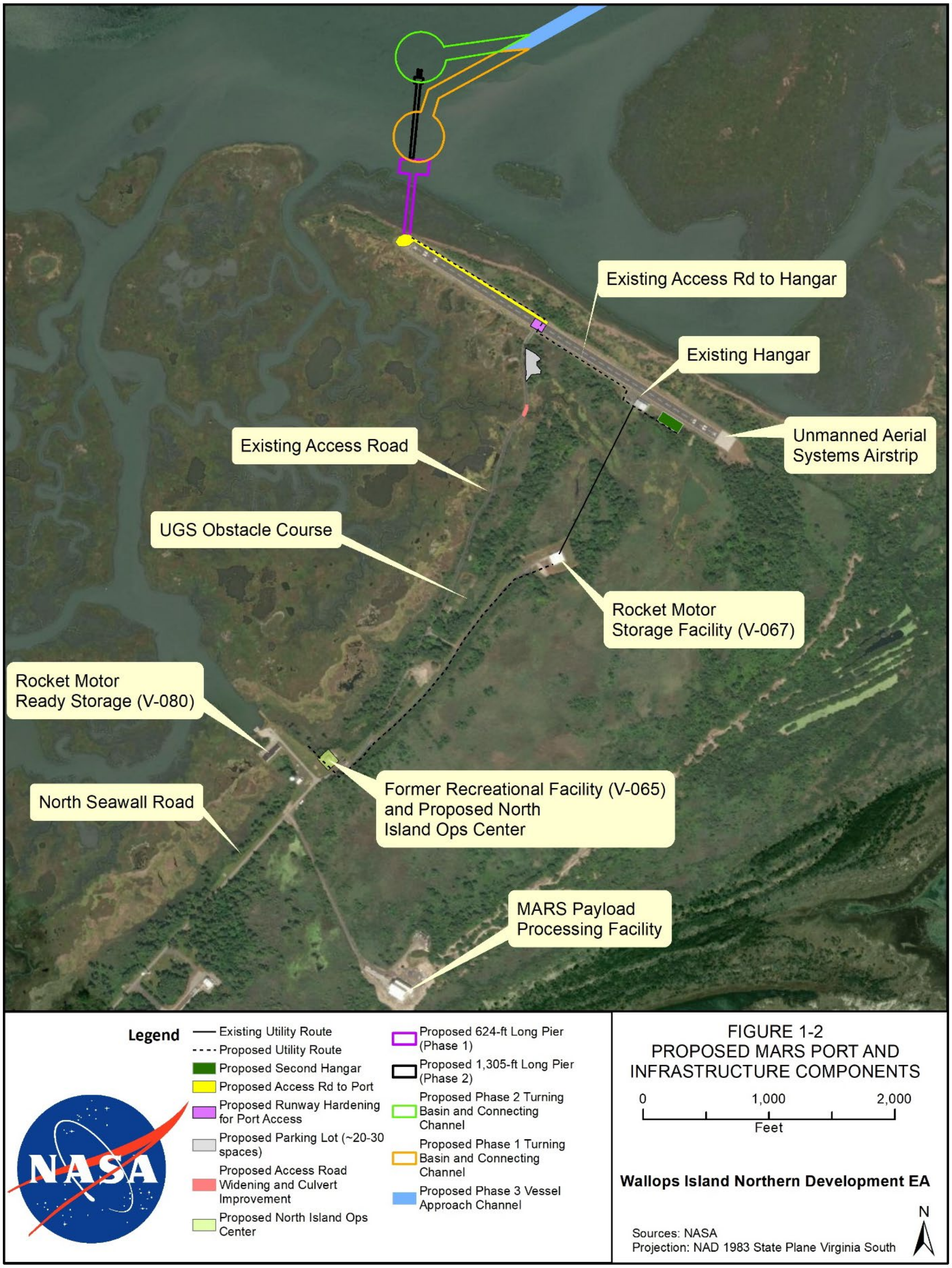

Figure 1-2. Proposed MARS Port and Infrastructure Components

1.2 Location and Setting

WFF is in northern Accomack County on the Eastern Shore of Virginia. Accomack County is bordered by Northampton County on the south, the state of Maryland on the north, the Atlantic Ocean on the east, and the Chesapeake Bay on the west. WFF consists of three separate land areas: Main Base, Mainland, and Wallops Island (**Figure 1-1**). Collectively, WFF covers approximately 2,670 hectares (ha) (6,600 acres [ac]). The Proposed Action would be implemented on NASA-owned land on Wallops Island, Commonwealth of Virginia submerged bottomlands, and U.S. Army Corps of Engineers (USACE) maintained federal navigation channels.

Wallops Island is a barrier island located along Virginia's Atlantic coast. The 3 kilometer (km) (2 mile [mi]) long Wallops causeway and bridge, owned and maintained by NASA, connects Wallops Island to the Mainland. Encompassing approximately 1,375 ha (3,400 ac) and surrounded by water, Wallops Island is approximately 11 km (7 mi) long by 2.4 km (1.5 mi) wide. The Atlantic Ocean borders Wallops Island to the east, and Chincoteague Inlet delineates the northern coastline. Marshland, interlaced with small creeks, covers the entire western approach to Wallops Island.

1.3 NASA's Mission

For over 70 years, WFF has flown thousands of research vehicles in the quest for information on the flight characteristics of airplanes, launch vehicles, and spacecraft, as well as to increase knowledge of the Earth's upper atmosphere and the near space environment. WFF supports aeronautical research, science technology, and education by providing NASA centers and other U.S. government agencies access to resources such as special use (i.e., controlled/restricted) airspace, research runways, and launch pads. WFF regularly provides launch support for the commercial launch industry, either directly or through MARS. WFF facilitates a wide array of U.S. Department of Defense (DoD) research, development, and training missions, including target and missile launches, and aircraft development. The flight programs and projects supported by WFF range from small sounding rockets, unmanned scientific balloons and UAS, manned aircraft, and orbital tracking to next generation launch vehicle development, expendable launch vehicles, and small and medium classed orbital spacecraft. WFF conducts many of these programs from the Main Base research airport, the MARS UAS Airstrip, and the Wallops Island launch range.

NASA and its partners use the Mainland and Wallops Island sites for testing and launch activities, Navy training, and research facilities. The Mainland facilities include storage buildings, radar antennas and transmitter systems, and associated buildings. The southern end of Wallops Island houses the launch complexes, integration facilities, and associated structures. Northern Wallops Island facilities include the MARS UAS Airstrip, blockhouses, assembly shops, dynamic balancing facilities, tracking facilities, payload processing and fueling, and other related support structures. The Navy's AEGIS, Wallops Island Engineering Test Center, and Ship Self Defense System Facilities are in the middle of Wallops Island. Restricted airspace managed by NASA overlies all of Wallops Island, Mainland, and the Main Base (NASA 2019a).

1.4 Purpose and Need

1.4.1 Background for Purpose and Need

The goal of the MARAD Marine Highway Program is to expand the use of America's navigable waterways; to develop and increase marine highway service options; and to facilitate their further integration into the current U.S. surface transportation system, especially where water-based transport is the most efficient, effective, and sustainable option (MARAD 2020a). The Project is located on the U.S. Marine Highway Program's M-95 Marine Highway Corridor that includes the Atlantic Ocean coastal waters; Atlantic Intracoastal Waterway; and connecting commercial navigation channels, ports, and harbors spanning 15 states including Virginia.

The proposed Wallops Island M-95 Intermodal Barge Service project is not the standard MARAD project with large container vessels moving tons of cargo on a regularly based schedule. Instead, this project would include small barges moving spacecraft, equipment, and experiments; and allowing vessels to dock for research, testing, and training. It also has the potential to support the growth of existing operations at WFF; enhance Science, Technology, Engineering, and Math (STEM) research opportunities; and spur high-tech/high-paying jobs in a predominantly rural area (MARAD 2019a).

The VCSFA, also known as 'Virginia Space,' was created in 1995 by the General Assembly of the Commonwealth of Virginia to promote the development of the commercial space flight industry, economic development, aerospace research, and education throughout the Commonwealth. In 1997, the VCSFA entered into a Reimbursable Space Act Agreement with NASA, which permitted the use of land on Wallops Island for launch pads. VCSFA also applied for and was granted a Federal Aviation Administration (FAA) license for commercial launches to orbital trajectories. This led to the establishment of MARS.

Currently, NASA and MARS operations require large Expendable Launch Vehicle (ELV) loads, potentially hazardous rocket components, and equipment to be transported from various locations to Wallops Island, utilizing roadways and railways or a combination of both. Many of these trips originate from Norfolk, Virginia; Philadelphia, Pennsylvania; and Wilmington, Delaware. Special permits are required to allow non-Department of Transportation certified cargo (rocket components, pressure vessels, spacecraft, etc.) to travel across public roads and highways. These shipments are often hazardous and require oversized vehicles. Additionally, there is a single bridge to Wallops Island providing no redundancy for the delivery of equipment and components to the WFF and MARS facilities.

An auxiliary function to launching rockets is recovery. This is both a nominal activity for payloads or spent stages, as well as part of contingency operations in the event of a mishap. Presently, these operations are based out of different local commercial harbors though no emergency recovery efforts have been required to date at MARS. The current contingency is to bring recovered items back to the public port at Curtis Merritt Harbor in Chincoteague, Virginia (across the Chincoteague Channel from Wallops Island), then overland approximately 30 km (20 mi). If recovered components are too large for Curtis Merritt Harbor, they would be taken to Port Cape Charles on Cape Charles, Virginia (approximately 90 km (60 mi) south of Wallops Island). It would be advantageous to base both the planned and emergency recovery activities out of the proposed MARS Port located on a secured federal facility.

1.4.2 Purpose

The mission of WFF is to provide unique expertise, facilities, and carriers (e.g., manned and unmanned aircraft, surface and subsurface vessels, balloons, sounding and orbital rockets) to enable rapid response, frequent, low-cost flight opportunities for a diverse customer base. This mission drives its programs and objectives, which in turn drive its facilities and infrastructure. In addition to fulfilling its own mission, WFF provides unique services to NASA, civil and commercial customers, defense, and academia, many of which are guided at some level by the 2020 U.S. National Space Policy. Construction of the MARS Port, which would include a pier, and operations area, would provide barge access and berthing to offload large launch vehicle components and related equipment for MARS and NASA. The MARS Port would also be part of MARAD's M-95 Marine Highway Corridor and is a portion of this proposed Wallops Island north end development project.

The purpose of the Proposed Action is to increase safety and security while reducing costs, traffic, congestion, and air emissions by removing potentially hazardous transportation operations off roadways. Research by the Texas A&M Transportation Institute (Texas A&M 2017) has shown that water transportation, while one of the least common methods of transportation, is by far the safest in terms of injuries per ton-miles travelled. Water transportation sees a much lower rate of fatalities than railroad or highway transportation, is the most fuel-efficient method of transportation, and has far lower emissions than those from railcars or trucks. This is partly due to the greater carrying capacity of a barge over a semi-tractor/trailer or railcar. The Proposed Action would also help to eliminate damage done to roads by transportation vehicles carrying large space assets, which can often exceed the level of structural capacity on the affected roadways (Texas A&M 2017).

Additional proposed components of the Proposed Action would provide dedicated spaces for work, laboratory, and storage to support research and testing of UAS, autonomous underwater/surface vehicles (AUV/ASV) and unmanned ground systems (UGS). These improvements would enhance operational capabilities for NASA and its partners and customers such as VCFSA, the Navy, National Oceanic and Atmospheric Administration (NOAA), and the U.S. Coast Guard (USCG). Operating these aquatic vehicles from the proposed port and access channel would permit direct access to the Navy's offshore Virginia Capes Operating Area test range via the USACE maintained federal navigation channel (Chincoteague Inlet Channel).

Rocket components, spacecraft, and autonomous systems are often corporate or academic proprietary or national security classified assets. The MARS Port would create a dedicated, secure facility to accept these systems, without having to traverse public roadways.

1.4.3 Need

As indicated in Section 1.4 of the *Final Site-wide PEIS* and summarized below, the following items encompass the underlying need for expanding WFF operational capacities, including the development of the MARS Port:

1. Growing U.S. focus on commercial space;
2. More frequent partnerships with DoD agencies;
3. Continued role in academia, civil space science, exploration, and discovery;
4. Safely and securely increasing operation frequency on Wallops Island; and
5. Aging and inadequate infrastructure.

The construction and operation of the MARS Port would assist with meeting these needs by supporting AUV/ASV testing and operational capabilities for the USCG, Navy, NOAA, and other customers.

The associated channel dredging and new infrastructure construction associated with the Proposed Action would address the need to improve the aging and inadequate infrastructure. The current infrastructure at WFF cannot sustain the proposed increase in operational capacities associated with the MARS Port. The proposed infrastructure improvements are critical to ensure the capability of moving space freight and/or test vehicles from sea to land to air, which would make the MARS Port a true intermodal facility.

The expanded operational capability provided by the MARS Port would support the anticipated increase in WFF launch frequency and meets the need of commercial launch service providers to barge rocket components, payloads, and hardware directly to Wallops Island. These commercial providers would also gain the ability to recover spent rocket cores, stages, and/or boosters and barge them directly back to WFF for possible reuse in future launches.

The remote and secluded nature of the project location meets the need to support highly secure DoD missions and research that cannot embark from or dock at public facilities. The MARS Port would allow testing of vessels with classified or sensitive programs to be docked and operated in a secure environment.

The MARS Port also meets VCSFA's need to host and support large scale aquatic testing in a port setting without impacting barging schedules, capacity, or production limitations that may occur at private or commercial ports. Additionally, it would allow unmanned aquatic customers to develop and test their vehicles either alone or in concert with the exiting UAS Airstrip. The dredging of an approach channel to a final depth of 3.7 meters (m; 12 feet [ft]) below Mean Lower Low Water (MLLW) is the optimal depth to meet the need to yield the ultimate opportunities for usage of the MARS Port.

Construction and operation of the MARS Port would enable oversized equipment and potentially hazardous vehicles to be delivered directly to Wallops Island by sea. This meets the need to remove a portion of the heavy loads that stress existing roads and the Wallops Island causeway bridge, presently the sole access point to Wallops Island. Removing hazardous loads from public roadways would also provide a buffer zone away from the public, thereby increasing the safety of WFF operations.

1.5 Cooperating Agencies

As defined in 40 CFR § 1508.5, and further clarified in subsequent CEQ 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.

NASA, as the property owner and project proponent, is the lead agency and is responsible for ensuring overall compliance with the applicable environmental statutes. MARAD is a cooperating agency since they may grant funds toward construction of the pier and port area. USACE is a cooperating agency since they would be authorizing permits under Section 404 of the Clean Water Act (CWA) and Section 10 of the Rivers and Harbors Act due to the potential for dredging or placement of fill in waters of the U.S. VCSFA is also serving as a cooperating state agency because they are providing final funding and oversight of the design, construction, and operation of the Proposed Action.

2 Description of the Proposed Action and Alternatives

2.1 Introduction

This chapter describes the Proposed Action to develop the MARS Port at the north end of Wallops Island. Section 2.2 describes the alternatives considered to implement the Proposed Action. Section 2.3 presents components that are common among all the action alternatives. Sections 2.4 through 2.7 present the Proposed Action, Alternative 1, Alternative 2, and the No Action Alternative, respectively. Section 2.8 presents a summary of the NEPA guidance and public participation process for the EA. Finally, Section 2.9 summarizes the potential environmental impacts.

2.2 Alternatives

In Section 2.2, NASA presents the following three elements used for the development and selection of alternatives: 1) Alternatives Initially Considered, 2) Alternatives Carried Forward for EA Analysis; and 3) Alternatives Considered but Not Carried Forward for EA Analysis (e.g., dismissed from analysis in the EA).

2.2.1 Alternatives Considered

NASA and VCSFA developed siting criteria for the MARS Port based on operational requirements including controlling depth for expected vessel types, location and extent of channel dredging and long-term maintenance, operational control and security requirements, engineering aspects, and minimization of environmental disturbance. Both existing and new project locations were considered and NASA initially considered seven alternatives to the Proposed Action, six action alternatives along with the No Action Alternative.

2.2.2 Alternatives Carried Forward for Analysis

The following alternatives are carried forward in the EA for detailed analysis:

Proposed Action: The MARS Port would provide a port and operations area along with associated capabilities for VCSFA, NASA WFF, and other customers. The MARS Port would also serve as a new part of the MARAD M-95 Marine Highway Corridor. Under the Proposed Action, the MARS Port including a 398 m (1,305 ft) fixed pier and turning basin would be constructed on (and within the vicinity of) the UAS Airstrip located at the north end of Wallops Island **(Figure 1-2)**. Infrastructure, including new facilities and improvements to the airstrip, utilities, and the existing access road (involving widening of an existing culvert), would likewise be constructed/installed as part of the Proposed Action. The Proposed Action would be constructed in phases, which would be driven by customer need and would ultimately be tied to funding. Each phase would help to expand the operational capability provided by the MARS Port to support the anticipated increase in WFF launch frequency and meet the need of commercial launch service providers to barge rocket components, payloads, and hardware directly to Wallops Island.

The Proposed Action would also include the dredging of new and existing channels for enhanced vessel approach purposes (**Figure 2-1**). The vessel approach channel, which would interface with the USACE designated Chincoteague Inlet Channel and the Chincoteague Inlet to Bogues Bay Connecting Waters, would be used by a variety of shallow-draft manned and unmanned vessels. For the Chincoteague Inlet Channel, the USACE maintains a channel depth of 3.7 m (12 ft) and width of 61 m (200 ft) from the Ocean Bar in the Atlantic Ocean to the mouth of the inlet. The second component is a channel 2.7 m (9 ft) deep and 30.5-45.7 m (100-150 ft) wide from the inlet through the "canal" and then along Chincoteague Channel until just north of the state highway bridge to Chincoteague (USACE 2020a). The Chincoteague Inlet to Bogues Bay Connecting Waters is a federal waterway, that is currently unfunded for maintenance.

Construction of the pier, dredging activities, and onshore facilities and infrastructure under the Proposed Action would be carried out in three separate phases:

- **Phase 1** would be construction of a 190 m (624 ft) long fixed pier, a 61 m (200 ft) radius turning basin (2.7 m [9 ft] deep below MLLW) and dredging of the vessel approach channel to a final depth of 1.5 m to 2.7 m (5 ft to 9 ft) below MLLW (red outline on **Figure 2-2**). Additionally, improvements would be made to the existing paved UAS Airstrip access road and a temporary wastewater holding tank would be installed adjacent to a new onshore hangar;
- **Phase 2** would be construction of a 206 m (676 ft) long extension of the fixed pier to a total length of 398 m (1,305 ft) and dredging of a 61 m (200 ft) radius turning basin (located at the end of the pier extension; shaded pink on **Figure 2-2**) to a final depth of 2.7 m (9 ft) below MLLW; and
- **Phase 3** of construction would be additional dredging to a final depth of 3.7 m (12 ft) below MLLW of the turning basin and the vessel approach channel, specifically the approximately 3,600 m (11,800 ft)-long portion of the channel from the Phase 2 turning basin to where it meets with the Chincoteague Inlet Channel (shaded blue on **Figure 2-2**). Based on analysis of potential future clients and vessels, a final depth of 3.7 m (12 ft) below MLLW was determined to be the optimal depth to yield the ultimate opportunities for the M-95 channel.

The portion of channel shown in pink on **Figure 2-2**, which connects the vessel approach channel to the Phase 2 turning basin, is naturally deeper than 2.7 m (9 ft) below MLLW and therefore, would not require any dredging during Phase 2. The estimated timeline for construction of the Proposed Action would have Phase 1 beginning in 2023 and being completed by 2026, with subsequent phases occurring approximately 1 to 2 years after completion of the prior phase. Thus, construction of the Proposed Action would take a total of between 22.5 months and 24 months of active work to complete (not including the lag time between phases), depending on whether pier construction and dredging activities would occur concurrently or consecutively.

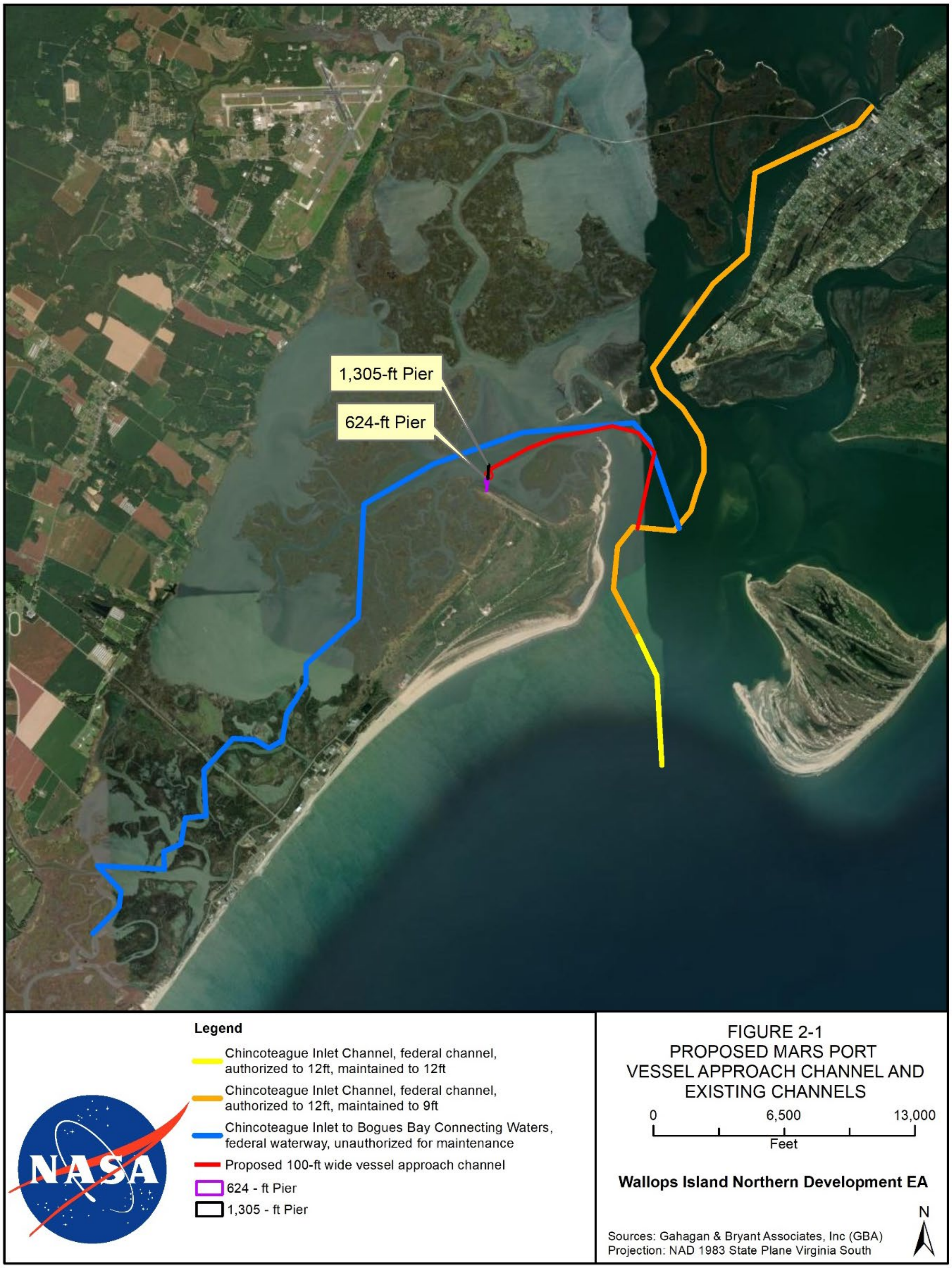

Figure 2-1. Proposed MARS Port Vessel Approach Channel and Existing Channels

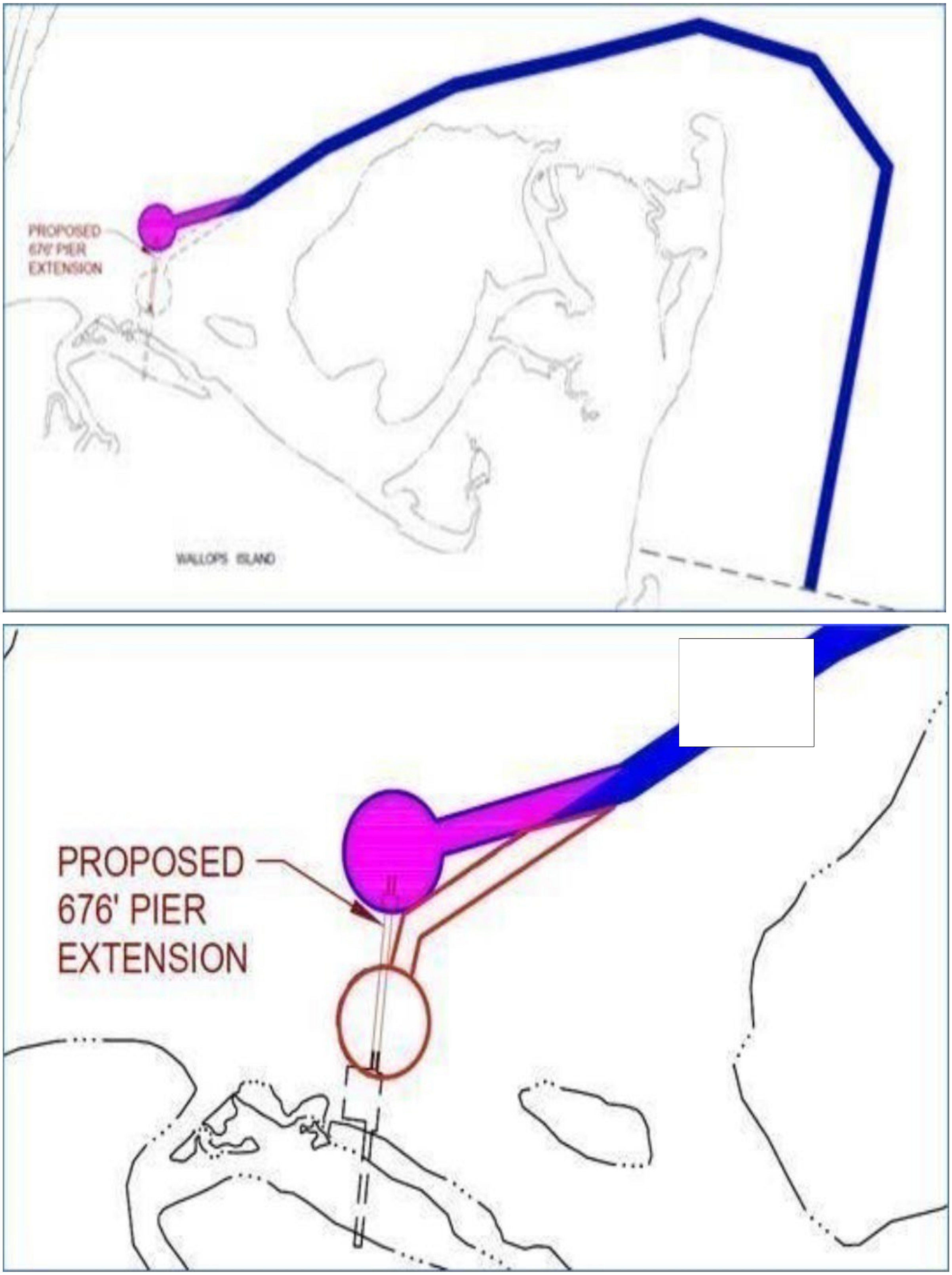

Figure 2-2. Diagram of Proposed Phased Construction

Alternative 1: Alternative 1 would include the same elements that were described for the Proposed Action *through Phase 1 of construction only*; under Alternative 1, Phases 2 and 3 of construction would not occur. The proposed fixed pier would be constructed to a total length of 190 m (624 ft); a 2.7 m (9 ft) deep turning basin with a 61 m (200 ft) radius would be included, and the 3,900 m (12,800 ft) long vessel approach channel would be dredged 30 m (100 ft) wide and up to 2.7 m (9 ft) deep.

Alternative 2: Alternative 2 would include the same elements that were described for the Proposed Action *through Phase 2 of construction only*; under Alternative 2, Phase 3 of construction would not occur. The proposed fixed pier would be constructed initially to a length of 190 m (624 ft) with a turning basin, and then during Phase 2 the fixed pier would be extended by 206 m (676 ft) to a total length of 398 m (1,305 ft) and a new 61 m (200 ft) radius turning basin would be dredged to 2.7 m (9 ft) deep at the end of the extended pier. The 3,900 m (12,800 ft) vessel approach channel would be dredged 30 m (100 ft) wide and up to 2.7 m (9 ft) deep.

No Action Alternative: The No Action Alternative reflects the status quo, in which the new MARS Port would not be constructed. The port, operations area, and intermodal facility would not become part of the M-95 Marine Highway Corridor. NASA WFF and VCSFA would continue to use existing facilities and available transportation routes to support their respective missions.

The Proposed Action, Alternative 1, Alternative 2, and the No Action Alternative are described in greater detail in Sections 2.4, 2.5, 2.6, and 2.7, respectively.

2.2.3 Alternatives Considered but Not Carried Forward

Four of the seven action alternatives for the proposed MARS Port were dismissed from further consideration because they failed to meet the Purpose and Need. These four alternative locations are outside of MARS operational control and in areas open to the general population of Wallops personnel, which would severely limit the use of the MARS Port based on security requirements of potential clients **(Figure 2-3)**. These four locations were also discounted based on the potential environmental impacts and the costs of additional initial and long-term maintenance dredging that would be required and the associated long-term maintenance. The four alternatives considered but dismissed, and additional rationale for their dismissal, are presented below.

2.2.3.1 *Alternative 3: MARS Port at North Island Boat Basin*

Alternative 3 was considered in the *Final Site-wide PEIS* (North Wallops Island Deep-water Port and Operations Area – Port Path 3). Construction and operation of Alternative 3 would require widening and deepening an approximately 2.0 km (6,800 ft) vessel approach channel. These channel alterations would begin east of Ballast Narrows, through Sloop Gut, and terminate at the North Island Boat Basin. Dredging a new channel wide enough to support MLLW drafts of 3.5 to 4.5 m (12 to 15 ft) would result in substantial wetland and habitat impacts in Sloop Gut. The required alterations to the existing access would also potentially increase the hydrologic exchange within the area, thereby changing salinity and estuarine biota. Additionally, the proposed channel alternations would increase potential environmental damage from enhanced ingress of storm surges and associated long term erosion. Based on the potential environmental impacts associated with Alternative 3, NASA dismissed this Alternative from further analysis in this EA.

2.2.3.2 *Alternative 4: MARS Port at Curtis Merritt Harbor, Chincoteague Island*

The Curtis Merritt harbor and docks are owned by the Town of Chincoteague and would require NASA to purchase land adjacent to the harbor to develop the infrastructure needed to support the MARS Port. Transport of heavy equipment and launch vehicle components would require access through residential areas of Chincoteague Island along Main Street and Chincoteague Road (State Road 175) to the NASA WFF Main Base. Additionally, the distance from the Curtis Merritt Harbor location to the MARS facilities on Wallops Island (including the UAS Airstrip) is greater than the other action alternatives; therefore, NASA dismissed Alternative 4 from further consideration.

2.2.3.3 *Alternative 5: MARS Port at Oceanside, Wallops Island*

Alternative 5 was considered in the *Final Site-wide PEIS* (North Wallops Island Deep-water Port and Operations Area – Port Path 1). Alternative 5 would require extensive channel dredging and shoreline armoring, thereby presenting substantial engineering and permitting challenges. Additionally, there is no existing infrastructure at this location and the site would require considerable road construction through sensitive dune and wetland habitats to tie into existing roadways. Alternative 5 was dismissed from further consideration based on these factors.

2.2.3.4 *Alternative 6: MARS Port at Old Barge Basin, Wallops Island*

Alternative 6 would consist of developing the MARS Port at one of two old barge basins located on the southwest side of Wallops Island adjacent to North Bypass Road (**Figure 2-3**). Although these sites are in the central portion of Wallops Island, they are not within the MARS area of control and are in areas open to the general population of the base. They would also require extensive dredging to establish and maintain an approach channel that would connect the existing Federal Channel in Chincoteague Inlet to adjacent waters. A portion of the required channel dredging for Alternative 6 was included in the *Final Site-wide PEIS* under the Maintenance Dredging and North Wallops Island Deep-water Port and Operations Area – Port Path 3 alternatives. It is likely that dredging to the depths required in the interior marshes of western Wallops Island would have potentially significant impacts on existing ecological resources in the area. Furthermore, NASA is considering replacing the existing NASA-owned Causeway Bridge that crosses Cat Creek and has partnered with the Federal Highway Administration (FHWA) to design and plan the new bridge. Should this project be implemented as proposed with a new lower-profile structure, the use of the old barge basin located behind Pad 0-A, southwest of the bridge would be severely limited. Therefore, Alternative 6 was also dismissed from further consideration.

Figure 2-3. Alternatives Considered But Not Carried Forward

2.3 Common Components Among Action Alternatives

The following components would be identical or very similar for all action alternatives (i.e., the Proposed Action and Alternatives 1 and 2).

2.3.1 Port Components

The new pier would include an access trestle and combination dock/ramp to support the loading and unloading of barges and research vessels.

The port facility would include the following elements:

- The pier would be designed for an HS-20 traffic loading, which would accommodate access by emergency vehicles, a mobile crane, and trailered loads/equipment. HS-20 is the term used by the American Association of State Highway and Transportation Officials and American Concrete Institute to describe normal moving traffic loading conditions up to 18-wheeler loading. This loading assumes a 7,300 kilogram (kg) (16,000 pound [lb]) wheel load and therefore a 14,500 kg (32,000 lb) axle load.
- The dock/ramp would be oriented to allow loading/unloading of barges and research vessels by a mobile crane. The anticipated crane specifications are based upon a 160 tonne (175 ton) Liebherr LTM 1150-1. A typical piece of equipment anticipated being offloaded at the dock would be a 4 m (13 ft) diameter by 18 m (60 ft) long tank. The ramp would allow for launching and recovery of smaller research vessels.
- The pier would be designed to support expansion and deepening of the channel basin for larger vessels, if needed in the future. The design of the piling in the dock/ramp will consider the future expansion and deepening.
- The deck height (approximately 1.8 m [6 ft] North American Vertical Datum of 1988 [NAVD88]) would be below the Base Flood Elevation (2.7 m [9 ft] NAVD88 on Wallops Island) due to operational restrictions and to match projected barge deck height. The structural design of the deck would take sea level rise and storm surge into consideration.
- The access trestle would be supported by piles designed to span over tidal wetlands. Pile bents would be spaced at approximately 6 m (20 ft) intervals. Precast components would be used to the extent possible for the trestle and dock segments. Battered piles (i.e., a pile driven at an angle) would be incorporated into the design to laterally strengthen the pier.

2.3.2 Channel Dredging

A variety of shallow-draft (0.6 to 1.2 m [2 to 4 ft]) manned and unmanned vessels would be serviced by the MARS Port. The major navigational service would be a tug and barge configuration of an approximately 45 m by 12 m (150 ft by 40 ft) deck barge propelled by a tugboat. Mechanical dredging (e.g., clamshell bucket dredge) would be employed to create a new channel that would interface with the existing USACE designated Chincoteague Inlet Channel and the Chincoteague

Inlet to Bogues Bay Connecting Waters. A general discussion of mechanical dredging is presented in the *Final Site-wide PEIS* (Section 3.5, Page 3-85) and summarized below

Mechanical dredging excavates in situ sediments with a bucket. Depending on the bucket and scow (hopper) characteristics, the water content of the dredged material is approximately 10 percent. Mechanical dredges are often used in tightly confined areas, such as harbors, around docks and piers, and in relatively protected channels. By using a number of scows with one dredge, mechanical dredging can proceed continuously; as one scow is being filled, another can be towed to the placement site.

One of the most common types of mechanical dredges is the clamshell dredge, which is named for the type of bucket used in the dredging operation. The dredging process consists of lowering the bucket to the channel or basin floor, closing the bucket and raising it back to the water surface, and depositing the dredged material into a scow. The efficiency and capacity of this type of dredging is determined by the bucket cycle time, capacity of the bucket, which varies between 1 and 38 cubic meters (m^3; 1.5 and 50 cubic yards [yd^3]), scow capacity, which typically varies from 100 to 4,587 m^3 (130 to 6,000 yd^3), and the number of available scows.

The vessel approach channel would intersect with the Chincoteague Inlet Channel and the Chincoteague Inlet to Bogues Bay Connecting Waters **(Figure 2-1)**. The proposed width of the approach channel (30.5 m [100 ft]) is consistent with the dimensions and depth of the Federal Channel. Estimated dredging volumes for the vessel approach channel and turning basin are provided in **Table 2-1**.

Table 2 1. Channel Dimensions and Estimated Dredging Volumes

	Phase 1	Phase 2	Phase 3
Channel depth	2.7 m (9 ft) deep below MLLW	2.7 m (9 ft) deep below MLLW	3.6 m (12 ft) deep below MLLW
Channel length	3,900 m (12,800 ft)	3,600 m (11,800 ft)	3,600 m (11,800 ft)
Channel dredging volume	11,500 m^3 (15,100 yd^3)	0	26,500 m^3 (34,600 yd^3)
Turning Basin dredging volume	31,000 m^3 (40,500 yd^3)	600 m^3 (800 yd^3)	2,500 m^3 (3,200 yd^3)
Total volume per phase:	42,500 m^3 (55,600 yd^3)	600 m^3 (800 yd^3)	29,000 m^3 (37,800 yd^3)
		Total Volume (Phases 1–3):	**72,100 m^3 (94,200 yd^3)**

Source: GBA 2020
m^3= cubic meters; yd^3 = cubic yards

Five potential sites for the placement of dredged material are summarized in **Table 2-2** and shown on **Figure 2-1**. The locations of the potential placement sites are discussed below. An initial geotechnical investigation and analysis were completed in March 2021, well prior to the dredged material placement. Further physical and chemical laboratory analysis of sediment samples in accordance with applicable USACE manuals may be required for offsite disposal of dredge material. Dredge material placed on NASA property must not contain munitions and explosives of concern (MEC) (see Section 3.2). Onsite placement must also meet U.S. Environmental Protection Agency (USEPA) regional screening levels for residential soils if placed in an upland location, or Virginia sediment and surface water screening levels if beneficially reused in wetlands. Additional physical and chemical analysis would help to determine the viability of the placement sites and help with the decision on which option to select.

Table 2 2. Potential Dredged Material Placement Sites

Option	Site	Description	Sail Distance from Basin[1]	Pipe Distance from Basin[2]	Sail Distance from Channel	Pipeline Distance from Channel
1	Wallops Open Ocean Dredge Material Placement Area	Open water placement site, closer than Lewis Creek or Norfolk Ocean disposal sites	9.8 km (6.1 mi)	--	7.1 km (4.4 mi)	--
2	Wallops Island Flood Protection/ Upland Placement	Reuse of material for flood mitigation through upland placement at site identified by NASA	--	853.4 m (2,800 ft)	--	3,669.8 m (12,040 ft)
3	Greenbackville Dredged Material Containment Facility (DMCF)	Upland DMCF run by USACE, requires both navigation of Chincoteague Channel and pumping on location	18.2 km (11.3 mi)	--	15.3 km (9.5 mi)	198.1 m (650 ft)
4	Wallops Island Shoreline Protection Placement	Reuse of material for shoreline protection and beach repair	12.1 km (7.5 mi)	--	11 km (6 mi)	--
5	Chincoteague National Wildlife Refuge Swan Cove Placement	Reuse of material for habitat restoration	-	9 km (5.6 mi)	-	6.9 km (4.3 mi)

[1] Sail distance" corresponds to the length of the path via water required to reach the placement site from the centroid of dredging in the proposed turning basin or approach channel, in statute miles.
[2] Pipe distance" refers to the length of pipe required to reach the placement site from the centroid of dredging for a vessel loaded with dredged material.

Option 1: Wallops Open Ocean Dredge Material Placement Area

This area is located just offshore of Wallops Island with a transportation distance of the dredged material of approximately 7 km (4 nautical mi). Open water placement options typically present the lowest cost dredging option and allow for the widest array of dredging equipment, ranging from clamshell dredges to barge mounted excavators supplying dump barges or specially modified deck barges that are towed by tugboats to the dredged material placement site. Open water placement locations are controlled by the USACE, and a CWA Section 404 permit would be required for the use of this site. This option may also require a permit under Section 103 of the Marine Protection, Research, and Sanctuaries Act, which would be subject to USEPA review.

Option 2: Wallops Island Flood Protection/Upland Placement

This option involves the beneficial reuse of material for flood mitigation through upland placement in low lying areas on Wallops Island. For example, there are low lying areas in the vicinity of the culvert crossed by the main access road to the UAS Airstrip. This option was evaluated based on having a cutter suction dredge pump the material into this area. This option would also require development of containment measures for the dredged material in the form of containment dikes and the channeling of the effluent and its return into Bogues Bay. This effluent is the water that is used in the dredging process to transport the dredged material in slurry form to the placement location. Other alternatives could include thin layer placement for marsh enhancement in marsh areas a similar distance to the dredging location, or the use of geotubes, or synthetic membranes, for containing the dredged material.

Option 3: Greenbackville Dredged Material Containment Facility

The third dredged material placement option identified is the use of the upland Dredged Material Containment Facility (DMCF) owned and managed by USACE. USACE places material dredged from the upper reaches of the Chincoteague Channel into this DMCF. This option would require using a mechanical dredge to load the dredged material removed from the approach channel into barges. These barges would then be towed approximately 18 km (10 nautical mi) to the DMCF. A specialized hydraulic unloader would be required to discharge the dredged material from the transport barges and pump the material into the DMCF.

Option 4: Wallops Island Shoreline Protection Placement

If the dredged material from Phase 1 is determined to be compatible with the current shoreline sand, the material would be placed into the North Wallops Island beach borrow area to speed the recovery of this area for shoreline habitat. This borrow area was used as the source of sand to renourish the beach along the shoreline infrastructure protection area that was analyzed in the Final EA for the NASA WFF Shoreline Enhancement and Restoration Project (SERP) (NASA 2019c). This action was part of the WFF Shoreline Restoration and Infrastructure Protection Program (SRIPP) (NASA 2010b) which involves the beneficial reuse of clean, compatible sand to repair and protect areas of the shoreline within the Launch Range area on Wallops Island. For the Phase 2 and Phase 3 dredging and future maintenance dredging, NASA and MARS may work with the schedule for dredging events so that they coincide with ongoing shoreline renourishment actions as part of the SRIPP, and the material would be placed somewhere within the SERP Area. The SERP area includes the Wallops Island shoreline infrastructure protection area and the North Wallops Island beach borrow area (Figure 2-4).

Option 4 would require using a mechanical dredge to load the dredged material removed from the approach channel into barges. These barges would then be towed approximately 11 km (6 nautical mi) to the shoreline. A specialized hydraulic unloader would be required to discharge the dredged material from the transport barges and pump the material onto the placement areas.

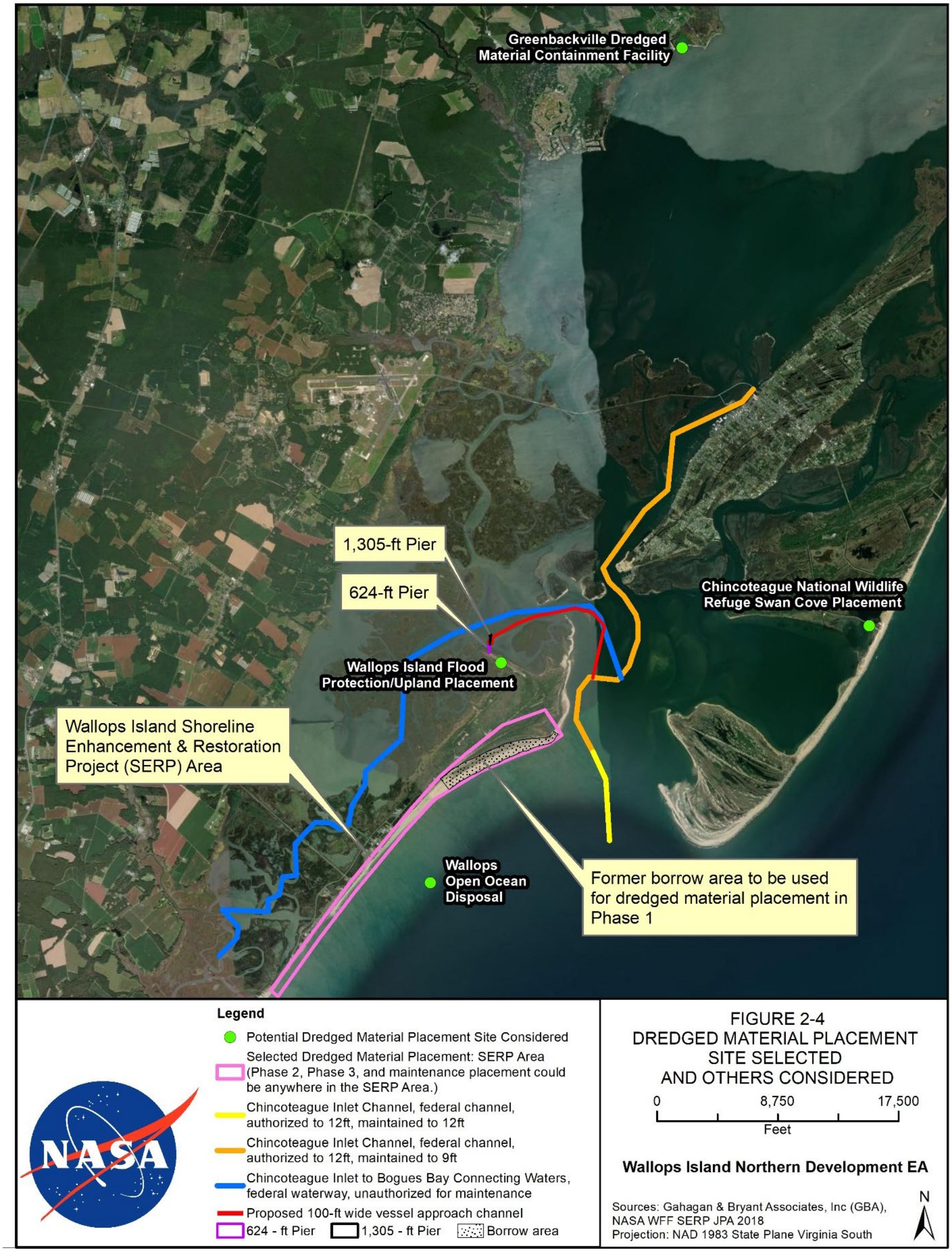

Figure 2-4. Dredged Material Placement Site Selected and Others Considered

Option 5: Chincoteague National Wildlife Refuge Swan Cove Placement

This option would involve the beneficial reuse of the dredged material for the Swan Cove Pool Restoration Project located in the Chincoteague National Wildlife Refuge (NWR). If dredged material is determined to be compatible, it would be used by the U.S. Fish and Wildlife Service (USFWS) to create berms and enhance and/or restore currently degraded areas of the estuarine-salt marsh habitat that have been negatively impacted by an undersized culvert restricting sediment deposition and tidal flow. Although USFWS would prefer material with a high proportion of sand, they will also accept dredge material containing high organic matter content. This option was evaluated based on having a cutter suction dredge pump the material to this area.

Dredge Material Placement Decision

Between 42,000 m^3 and 43,000 m^3 (56,000 yd^3 and 57,000 yd^3) of material would be dredged during the initial Phase 1 dredging event. VCSFA intends to utilize Option 4, the Wallops Island Shoreline Protection Placement, as the preferred dredge material placement option. Initial dredge materials would be placed in the North Wallops Island Beach Borrow Area to speed the recovery of the borrow area for shoreline habitat. For the Phase 2 and Phase 3 dredging and future maintenance dredging, NASA and MARS may work with the schedule for dredging events to coincide with ongoing shoreline renourishment actions as part of the SRIPP, and the material would be placed somewhere within the SERP area. The SERP Area includes the Wallops Island shoreline infrastructure protection area and the North Wallops Island Beach Borrow Area (**Figure 2-4**). While Option 1 is the most economical solution as it offers the lowest estimated mobilization costs as well as the lowest unit costs for dredging, transport, and placement, Option 4 is the most beneficial reuse of the material. The dredged material placed on Wallops Island is required to have the same physical characteristics (at least 90 percent sand) as the natural beach, and anything with a higher fine-grained content would not be suitable. Based on the geotechnical borings for the proposed project, the material is anticipated to be composed of approximately 95 percent sand and, therefore, would be suitable for shoreline renourishment.

Maintenance dredging of the basin and channel would be repeated periodically, as necessary to maintain the required depth and is expected to be infrequent and of short duration. Estimates of future maintenance dredging requirements have been modeled using historic dredge records made available by USACE Norfolk District. It was assumed that the proposed channel could be maintained at a navigable depth of 2.7 m or 3.7 m (9 ft or 12 ft), MLLW, and that different regions of the proposed channel would have different dredging requirements because of location and wave influence. The estimated dredging volume and interval is highly variable because federal navigation channel dredging records indicate that channel migration has occurred historically. Further, 2019 and 2021 survey data show large naturally occurring changes in the bathymetry that can require dredging to maintain the proposed channel alignment. Therefore, future dredging events could range from every 3 to 6 years with annualized dredge volumes ranging from 1,100 to 9,200 m^3 per year (1,400 to 12,000 yd^3 per year), depending on the depth and location(s) that need to be dredged.

2.3.3 Other Infrastructure and Facilities

Onshore facilities and infrastructure would be constructed or upgraded and are briefly summarized below. Their proposed locations are shown on **Figure 1-2**.

Project Support Building: A new, approximately 740 square meter (m^2; 8,000 square foot [ft^2]) building may be constructed on the site of the former Wallops Employee Morale Association Recreational Facility (V-065) (Old Wallops Beach Lifeboat Station) on the southwest end of the access road to the UAS Airstrip. Once the existing structure is removed or demolished, the proposed structure may be constructed and would serve as a new North Island Operations Center. The new building would have a maximum height of 12 m (40 ft) to avoid interference with a nearby air surveillance radar.

Second Hangar: A new, approximately 660 m^2 (7,125 ft^2) hangar would be constructed adjacent to the runway, east of the existing UAS Airstrip hangar. The new hangar would be a secure facility to support operations, store vehicles and equipment when not in use, accommodate vehicle maintenance as required, and provide a small meeting area for clients. The new hangar would have a maximum height of 12 m (40 ft) to avoid interference with a nearby air surveillance radar. This proposed second secure hangar would provide an additional area for MARS clients to use without interfering with usage of the existing hangar for UAS airfield operations.

Utility Infrastructure: Electricity, potable water, wastewater, and communications utilities may be extended to the Project Support Building from existing nearby infrastructure. Potable water would be supplied from the elevated north end tank (V-090), which has a 50,000 gallon capacity. Potable water supply piping would be placed in existing conduit that runs along North Seawall Road and extends from Building V-067 to the existing hangar at the UAS Airstrip. New conduits for electrical and communication utilities would be extended from the existing hangar to the proposed hangar at the UAS Airstrip. New utility conduits would also be installed along the new port access road to provide electrical and communication utilities to the pier. Wastewater from the hangars would be conveyed to a proposed temporary holding tank where it would be periodically collected and pumped into the NASA wastewater system for treatment.

Airstrip Lighting: New airstrip lighting meeting applicable FAA airfield standards would be installed at the UAS Airstrip. The lights would be located along the edge of the runway (one white light every 61 m [200 ft]). Lights would only be turned on when required by an airfield operation (i.e., night-time aircraft takeoffs or landings) and turned off when the operation is completed.

Airstrip Access Road Improvements (including culvert widening): The existing UAS Airstrip access road at the culvert crossing is not wide enough for two-way traffic or to accept trailered loads from the proposed MARS Port. This creates a pinch point and safety and operational hazard. A 40 m (130 ft) segment of the existing paved access road would be widened from 4.5 m (15 ft) to approximately 9 m (30 ft) and, in conjunction, the culvert over which the road crosses a drainage channel to Cow Gut would be widened (lengthened). The diameter of the culvert would remain the same.

Vehicle Parking Lot: A new asphalt parking area with spaces for up to 30 vehicles would be constructed near the northwest intersection of the UAS Airstrip access road and runway.

Runway Hardening for Port Access: A 30.5 m (100 ft) wide section of airstrip would be reinforced to accommodate heavy equipment and vehicles traversing the airfield between the proposed pier and the equipment parking/storage areas.

Access Road to Port: A new asphalt access road would be constructed inside the infiltration trench, along the north side of the existing UAS Airstrip from the intersection with the access road to the new MARS Port pier area.

No additional expansion beyond the Proposed Action is anticipated at this time. Any future proposed changes would be addressed in additional NEPA analysis.

2.3.4 Construction

Three phases of the Proposed Action for the proposed MARS Port and vessel approach channel were previously described in Section 2.2.3, as they helped to differentiate between the Proposed Action and Action Alternatives 1 and 2.

In general, construction would involve: (1) installing the onshore and pier components that would make up the MARS Port; (2) mechanical dredging of the vessel approach channel and turning basin; (3) placing dredged material; and (4) assembling or improving the proposed onshore facilities and infrastructure.

The estimated timeframe for construction of the Proposed Action would have Phase 1 beginning in 2023 and being completed by 2026, with subsequent phases occurring approximately 1 to 2 years after completion of the prior phases. It is assumed that construction of all proposed onshore project components and infrastructure would be completed during Phase 1 (although the North Island Operations Center may be constructed later). Similarly, Alternative 2 would have Phase 1 beginning in 2023 and include a 1 to 2 year lag between phases. With two crews (10 persons each), working 5 days per week (10 hour days), construction of the 190 m (624 ft) long pier under Phase 1 would take approximately 12 months to complete and construction of the 206 m (676 ft) long pier extension under Phase 2 (for a total pier length of 398 m [1,305 ft]) would take approximately 9.5 months to complete.

Estimated channel dredging and material placement volumes for each phase of construction are presented above in Section 2.3.2. Phase 1 dredging activities (turning basin and channel) would take approximately 30 days to complete; Phase 2 dredging (turning basin) would take approximately 7 days, and Phase 3 dredging (turning basin and channel) would take 30 days. Work would be performed 24 hours a day, seven days a week with two crews each working 12-hour shifts.

Typical equipment used during construction would include crane barges, material barges, dredging vessels, tugboat, vibratory pile hammer, diesel impact hammer, concrete truck, concrete pump truck, concrete vibrator, generator, welding machines, cutting torches, and various small tools.

2.3.5 Operations

VCSFA/MARS currently has a facilities team that mows grass once per week, monitors for eagles twice per week during nesting season, periodically removes tree and weed growth, and inspects the infiltration trench and the fencing around the Revolutionary War Earthworks. During summer months, a mosquito fogging service truck sprays the airfield once every two weeks. The pier structure would also require quarterly structural inspections.

Potential annual facility usage associated with the MARS Port is provided in **Table 2-3.** There would be an estimated 99 vessel trips per year once the MARS Port is operational.

2.4 Proposed Action: Phases 1, 2, and 3

The MARS Port and associated infrastructure components would be located adjacent to the existing UAS Airstrip and at the north end of Wallops Island **(Figure 1-2)**. Under the Proposed Action, the new MARS Port pier would initially be constructed to a length of 190 m (624 ft) with a 61 m (200 ft) radius, and 2.7 m (9 ft) deep below MLLW radius turning basin at the end to give vessels room to turn around within the narrow channel and head back out to open water (Phase 1). The construction of all onshore project components and infrastructure (except for the North Island Operations Center which may be constructed later) would be completed during Phase 1. During Phase 2, which would commence approximately 1 to 2 years following Phase 1, the fixed pier would be extended by 206 m (676 ft) for a total length of 398 m (1,305 ft) with a turning basin at the end of the lengthened pier to give vessels room to turn (**Figures 2-5** and **2-6**). Phase 3 (beginning approximately 1 to 2 years after Phase 2 is complete), would consist of additional dredging to a final depth of 3.6 m (12 ft) below MLLW for both the turning basin and vessel approach channel. Therefore, the Proposed Action would result in a total volume of 72,000 m^3 (94,200 yd^3) of dredged material requiring placement at one of the five proposed dredge material sites. Construction of the Proposed Action would take a total of between 22.5 months and 24 months of active work to complete (not including the lag time between phases), depending on whether pier construction and dredging activities would occur concurrently or consecutively.

Table 2 3. Potential MARS Port Operations/Facility Usage				
Potential Facility Usage	**Vessel Type**	**Quantity Assumptions**	**Total Barge / Vessel Trips**	**Phase Associated with Usage**
Medium Class ELV 1st Stage (Core) and 2nd stage	Shallow Draft Deck Barge & Inland Pushboat	3 launches per year; Each comes w/ ~4-6 truckloads of parts and equipment plus 2 heavy haulers	3	1
Venture Class ELV	Shallow Draft Deck Barge & Inland Pushboat	Potential for 12 launches per year; 3 trucks per launch	12	1
Venture Class 2 ELV	Shallow Draft Deck Barge & Inland Pushboat	9 launches per year; 1 truck per stage, 3-5 trucks for equipment	9	1
Venture Class Heavy ELV	Deck Barge & 1000-1200 HP Tugboat	3 launches per year, 3 first stage cores per launch w/ 1 truck each plus 3-5 trucks for equipment	3	2
Minotaur Class	Deck Barge & 1000-1200 HP Tugboat	4 launches per year, 3 stage/cores per launch w/ 1 truck each; 3-5 additional trucks for equipment	4	2
Recovery Effort	Shallow Draft Deck Barge & Inland Pushboat	1 per Venture Class ELV launch	12	1
Autonomous Surface Vehicle (ASV)	Trailered Vessel	1 deployment per month; each deployment has 5-10 vehicles included	12	1
Autonomous Underwater Vehicle (AUV)	Trailered Vessel	1 deployment every other month; each deployment has 5-10 vehicles included	6	1
Miscellaneous Usage	Shallow draft vessel	1 deployment every other month	6	2
Research Usage	Small Research Vessel	1 deployment every 4 months; each deployment has 5-10 vehicles included	3	2
Other Government Research & Testing	Trailered Vessel	1 deployment every other month	12	2
Other Site-wide PEIS Construction/Expansion	Deck Barge & Ocean Tug	2 large/oversized deliveries per year	1	2
Commodity Delivery	Deck Barge & Ocean Tug	16 total barges	16	3
		Annual Total Barge / Vessel Trips	99	

2.5 Alternative 1: Phase 1 only

This alternative would be like the Proposed Action; however, Phases 2 and 3 of construction would not be implemented. The fixed pier under this alternative would not be extended; it would be constructed to a final length of 190 m (624 ft) with a 61 m (200 ft) radius turning basin. Given the shorter pier length, the total volume of dredged material requiring placement under Alternative 1 would be approximately 42,500 m^3 (55,600 yd^3). Alternative 1 would also include the other infrastructure and facilities described in Section 2.3.3 (although the North Island Operations Center may be constructed later).

Figure 2-6 shows the pier layout plan and elevation for Alternative 1. Besides the final pier length and final turning basin and vessel approach channel depth, all other design elements would be the same between the Proposed Action and Alternative 1 (concrete piles, spans, load rating, etc.). While the required construction equipment would be the same for all action alternatives, the overall construction duration for Alternative 1 would be approximately 50 to 55 percent shorter than that of the Proposed Action based on the shorter pier length. Similarly, dredging under this alternative would be expected to occur within a shorter overall timeframe and result in a smaller total volume of dredged material, given that this alternative does not include Phase 3 of dredging the proposed channel to a total depth of 3.7 m (12 ft) below MLLW.

2.6 Alternative 2: Phases 1 and 2 only

This alternative would be like the Proposed Action; however, Phase 3 of construction would not be implemented. The fixed pier under this alternative would ultimately be extended to a final length of 398 m (1,305 ft) with a 61 m (200 ft) turning basin at the end; the 190 m (624 ft) long fixed pier and 61 m (200 ft) radius turning basin would be initially constructed during Phase 1. Given the longer pier length and new turning basin, the total volume of dredged material requirement placement under Alternative 2 would be approximately 43,100 m^3 (56,400 yd^3). Alternative 2 would also include the other infrastructure and facilities described in Section 2.3.3 (although the North Island Operations Center may be constructed later).

Figure 2-5 shows the pier layout plan and elevation for Alternative 2. Other than the final pier length and the location of the turning basin, all other design elements would be the same between Alternative 1 and Alternative 2 (concrete piles, spans, load rating, etc.). While the required construction equipment would be the same for all action alternatives, the overall construction duration for Alternative 2 would be approximately 5 to 10 percent shorter than that of the Proposed Action based on the shallower final turning basin and channel depth, given that this alternative does not include the Phase 3 dredging of either component to a total depth of 3.7 m (12 ft) below MLLW.

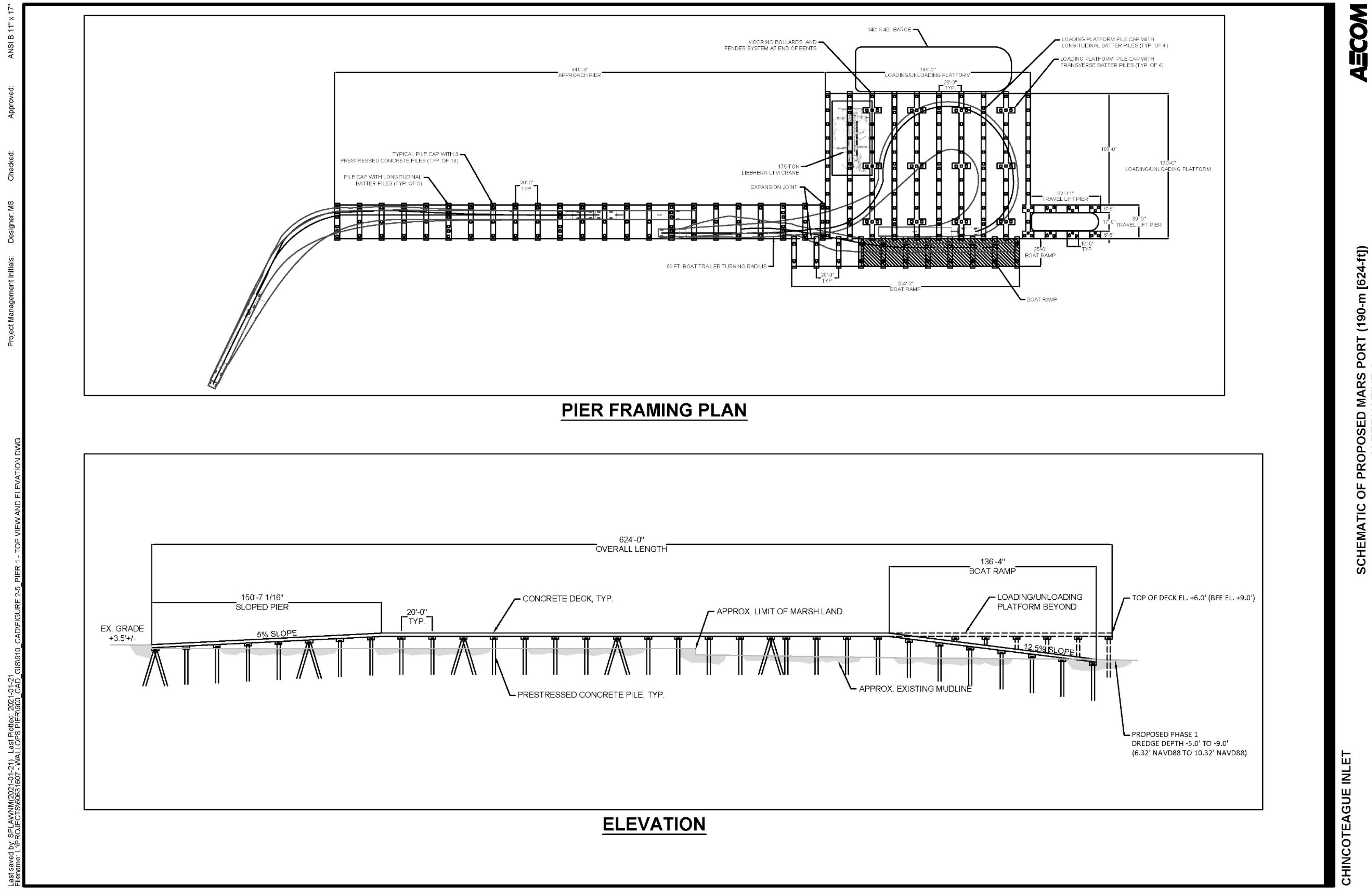

Figure 2-5. Preliminary Schematic of Proposed MARS Port – Phase 1

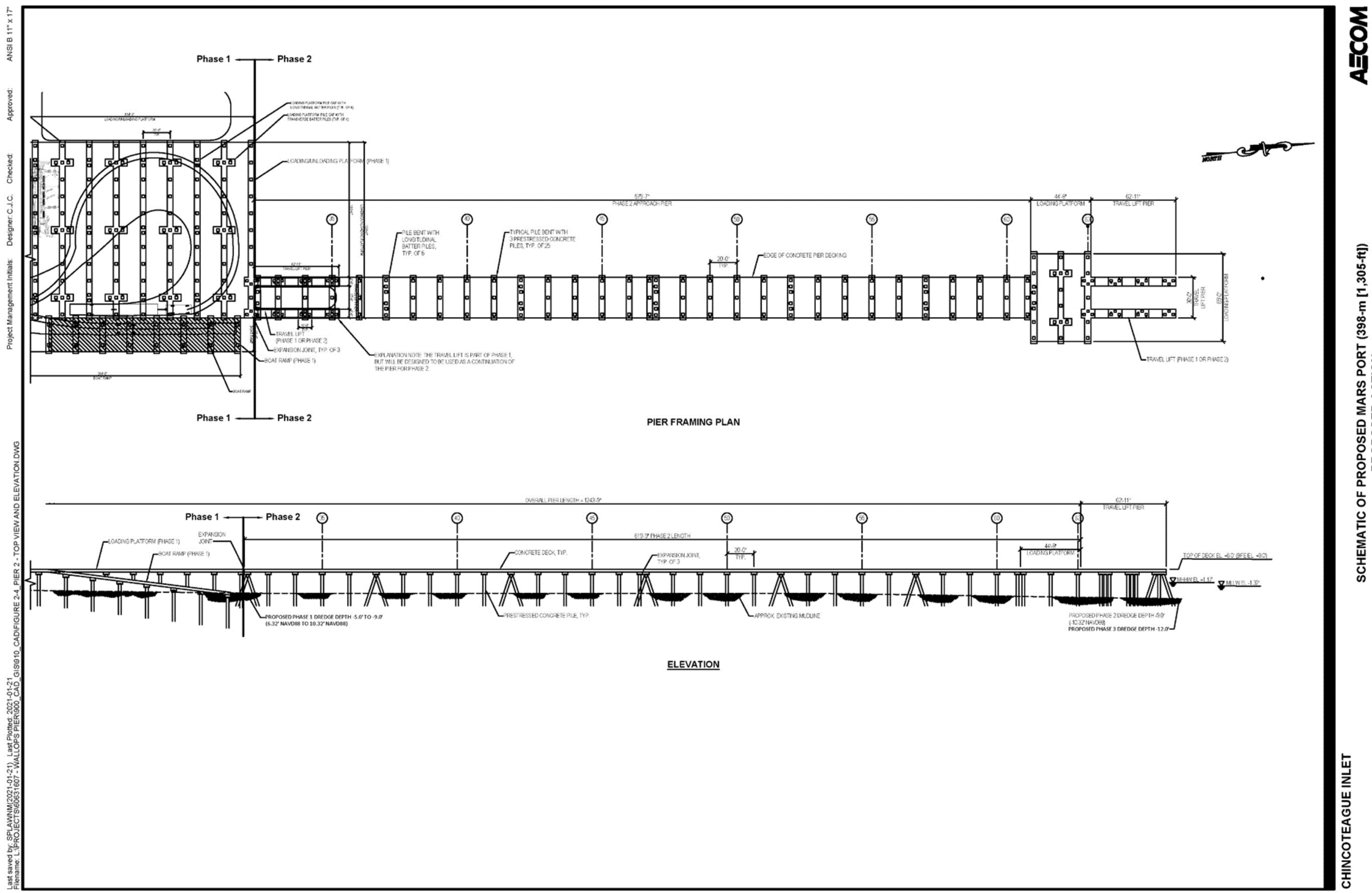

Figure 2-6. Preliminary Schematic of Proposed MARS Port – Phase 2

2.7 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 are compared to the anticipated effects of implementing the Proposed Action. Under the No Action Alternative, WFF would not develop the north end of Wallops Island nor construct a new MARS Port.

2.8 National Environmental Policy Act Guidance and Public Participation

This EA was prepared consistent with the CEQ regulations for implementing NEPA (40 CFR 1500-1508) issued in 1978, with minor revisions in 1979 and 1986. Because NASA began this EA before CEQ's revised (2020) NEPA regulation became effective on September 14, 2020, NASA applied the previously promulgated 1978 CEQ regulations in the preparation of this EA. The EA was also prepared in accordance with NASA Procedural Requirements 8580.1 *Implementing the National Environmental Policy Act* as promulgated in 14 CFR § 1216.3.

In addition to the requirements of NEPA, NASA has attempted to comply with Executive Order (EO) 13990 signed on January 20, 2021. EO 13990 directs federal agencies to review, and take action to address, federal regulations promulgated and other actions taken during the last four years that conflict with national objectives to improve public health and the environment; ensure access to clean air and water; limit exposure to dangerous chemicals and pesticides; hold polluters accountable, including those who disproportionately harm communities of color and low-income communities; reduce greenhouse gas emissions; bolster resilience to the impacts of climate change; restore and expand our national treasures and monuments; and prioritize both environmental justice and employment.

In preparing this environmental analysis, NASA used the process described below.

1. ***Outreach to government stakeholders*** – NASA sent consultation and coordination letters to federal, state, and local government agencies requesting comment on the Proposed Action and Alternatives on October 9, 2020. The responses NASA received are attached in **Appendix A**.
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 Alternatives including the No Action Alternative.
3. ***Announce that the Draft EA has been prepared*** – On December 15, 2021, advertisements were placed in three (3) newspapers local to WFF – the *Chincoteague Beacon,* the *Eastern Shore News,* and the *Eastern Shore Post* – notifying the public of the availability of the Draft EA.
4. ***Provide a public comment period*** – Federal, state, and local agencies and members of the public were invited to provide written comments on the Draft EA over a 30-day period,

between December 15, 2021 and January 17, 2022. Electronic versions of the project presentation were available to the public on the project website at https://code200-external.gsfc.nasa.gov/250-WFF/WIND-EA. Written comments on the analysis and findings presented in the Draft EA were accepted throughout the 30-day public comment period.

5. *Prepare a Final EA* – Following the public comment period, NASA has prepared the Final EA. The Draft EA has been revised as appropriate based on comments received during the public comment period. The Final EA provides the NASA decision-maker with a comprehensive review of the Proposed Action and the potential environmental impacts. The Final EA is available online at: https://code200-external.gsfc.nasa.gov/250-WFF/WIND-EA.

6. ***Issue a Final EA/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 EA analysis supports this conclusion, or a determination that an EIS would be required for the Proposed Action. Advertisement of the signed FONSI (as well as availability of the Final EA) will be published in the *Chincoteague Beacon*, the *Eastern Shore News*, and the *Eastern Shore Post*. If NASA determines an EIS is required, an NOI will be published in the Federal Register.

3 Affected Environment and Environmental Consequences

In accordance with NEPA requirements, this EA presents a focused analysis of the geographic areas and environmental and human resources potentially affected by the Proposed Action, Alternative 1, Alternative 2, and the No Action Alternative. The results of the analysis are presented in a comparative fashion that allows decision makers and the public to differentiate the alternatives.

CEQ regulations for implementing NEPA (40 CFR Parts 1500-1508) also require the discussion of impacts in proportion to their significance, with only enough discussion of non-significant issues to show why more study is not warranted. NEPA analyses should consider, but not analyze in detail, those areas or resources not potentially affected by a proposed action. The analysis in this EA considers the current conditions of the affected environment and compares those to conditions that might occur should WFF implement the Proposed Action, Alternative 1, Alternative 2, or the No Action Alternative.

The geographic area for this EA includes upland areas of Wallops Island near the UAS Airstrip and the marine environment surrounding the north end of Wallops Island.

Resources Considered but Eliminated from Detailed Analysis

Table 3-1 presents a list of resources that were analyzed in the *Final Site-wide PEIS* and considered in this EA. It has been determined that some resources do not warrant further consideration in this EA because the resource is not present within the affected environment, has not measurably changed from the analysis in the *Final Site-wide PEIS*, or would not be notably affected by the MARS Port project. **Table 3-1** indicates which resources are analyzed in detail in this EA due to the site-specific nature of the particular resource, the likelihood that the resource could be affected by the MARS Port project, or that the current analysis has measurably changed from the prior analysis in the *Final Site-wide PEIS*.

Table 3 1. Resources Considered in this EA				
Resource		**Tiered from *Final Site-wide PEIS***	**Analyzed in detail in this EA?**	**If *Yes*, EA Section** **If *No*, Justification for Elimination**
Physical Environment	Noise	No	Yes	Section 3.1
	Air Quality	Yes (Sect. 3.2.1 and Sect. 3.2.2.2.1)	No	Project emissions from construction, transportation, and unmanned or autonomous vehicles would be below comparative mobile source threshold. Temporary emissions would not have significant impact on regional air quality or significantly contribute to global emission of greenhouse gases
	Hazardous and Regulated Materials and Waste	Yes (Sect. 3.3.1 and Sect. 3.3.2.2.1)	No	Project would not generate the amounts of hazardous materials to impact human health and or the environment and materials would be managed in accordance with current procedures
	Toxic Substances, Environmental Compliance and Restoration Program, Storage Tank Management	No	No	No buildings, storage tanks, or Areas of Concern in the Project Area
	Munitions and Explosives of Concern (MEC)	No	Yes	Section 3.2
	Health and Safety	No	Yes	Section 3.3
	Land Use	Yes (Sect. 3.6.1 and Sect. 3.6.2.2.1)	No	New construction would change land use from undeveloped to developed within small portion of WFF footprint. A zoning change would not be required, and land use compatibility would not be affected
	Land Resources	No	Yes	Section 3.4
	Water Resources			
	Surface and Storm Waters	No	Yes	Section 3.5.1
	Groundwater	No	Yes	Section 3.5.2
	Wetlands	No	Yes	Section 3.5.3
	Marine Waters	Yes (Sect. 3.5.1.6)	No	Marine waters are defined as the Atlantic Ocean in *Final Site-wide PEIS* and would not be directly affected by the proposed project. Estuarine and tidal waters are presented in Section 3.5.1, Surface Waters
	Floodplains	No	Yes	Section 3.5.4
	Coastal Zone	No	Yes	Section 3.5.5
	Sea-Level Rise	No	Yes	Section 3.5.6

Table 3 1. Resources Considered in this EA				
Resource		**Tiered from *Final Site-wide PEIS***	**Analyzed in detail in this EA?**	**If *Yes*, EA Section If *No*, Justification for Elimination**
Biological Environment	Vegetation	No	Yes	Section 3.6
	Submerged Aquatic Vegetation	Yes (Sect. 3.8.1.3)	No	Nearest submerged aquatic vegetation is 4.8 km (3 mi) north of project and would have no potential to be affected by Proposed Action (VIMS 2019)
	Wildlife (Terrestrial, Aquatic)	No	Yes	Section 3.7
	Essential Fish Habitat	No	Yes	Section 3.8
	Special-Status Species (Terrestrial, Aquatic, and Avian)	No	Yes	Section 3.9
Social and Economic Environment	Airspace Management	Yes (Sect. 3.12)	No	Project will not affect WFF's existing Airspace Management procedures
	Transportation			
	Roads	No	Yes	Section 3.10.1
	Rail	Yes (Sect. 3.13.1.2 and 3.13.2.2.)	No	Project would not affect or use rail transportation
	Water	No	Yes	Section 3.10.2
	Infrastructure and Utilities			
	Potable Water	No	Yes	Section 3.11.1
	Wastewater Treatment	No	Yes	Section 3.11.2
	Electric Power	No	Yes	Section 3.11.3
	Communication	No	Yes	Section 3.11.4
	Waste Collection and Disposal Services	No	Yes	Section 3.11.5

Table 3 1. Resources Considered in this EA

Resource		Tiered from *Final Site-wide PEIS*	Analyzed in detail in this EA?	If *Yes*, EA Section If *No*, Justification for Elimination
Social and Economic Environment (continued)	Socioeconomics			
	Population	Yes (Sect. 3.15.1.1 and Sect. 3.15.2.2.1)	No	Project has no potential to result in changes to population
	Employment and Income	Yes (Sect. 3.15.1.2 and Sect. 3.15.2.2.1)	No	Project would result in temporary economic benefits to the region of influence
	Housing	Yes (Sect. 3.15.1.3 and Sect. 3.15.2.2.1)	No	Project has no potential to result in loss or addition of housing
	Environmental Justice (Including Protection of Children)	Yes (Sect. 3.16.1 and Sect. 3.16.2.2.1)	No	Project has no potential to affect communities outside of WFF or the Wallops NWR
	Visual Resources	Yes (Sect. 3.17.1.1 and Sect. 3.17.2.2)	No	Project is consistent with areas designated for development within 2008 WFF Facility Master Plan. Negligible impact as the project would remain consistent with historical use of areas
	Recreation	No	Yes	Section 3.12
Cultural Resources	Archaeological Resources	No	Yes	Section 3.13
	Architectural Resources	Yes (Sect. 3.18.1 and 3.18.2)	No	Project has no potential to affect architectural resources

3.1 Airborne Noise

This section provides an overview of the existing airborne ambient sound environment and the potential impacts that would be associated with the Proposed Action and No Action Alternatives. Underwater noise, and potential noise impacts to ecological receptors in terrestrial and aquatic habitats, as well as marine wildlife and special-status species are discussed in Sections 3.7 and 3.9, respectively.

Noise is generally described as unwanted sound, which can be based either on objective effects (hearing loss, damage to structures, etc.) or subjective judgments (e.g., community annoyance). Airborne noise is represented by a variety of metrics that are used to quantify the noise environment. Sound is usually represented on a logarithmic scale with a unit called the decibel (dB). Sound on the decibel scale is referred to as sound level. Human hearing is more sensitive to medium and high frequencies than to low and very high frequencies, so it is common to use maximum A-weighted decibel (dBA) metrics (also shown as dB L_{Amax}) representing the maximum A-weighted sound level over a duration of an event such as an aircraft overflight. A-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. The threshold of human hearing is approximately 0 dBA, and the threshold of discomfort or pain is around 120 dBA. A-weighted Sound Exposure Level (SEL) accounts for both the maximum sound level and the length of time a sound lasts and represents the total sound exposure for an entire event.

Noise is regulated under the Noise Control Act of 1972, as amended by the Quiet Communities Act of 1978, which sets forth the policy of the U.S. to promote an environment for all citizens that is free from noise that jeopardizes human health and welfare. The Act delegates authority to the states to regulate environmental noise and directs government agencies to comply with local community noise statutes and regulations (GSA 1972). The Accomack County Code provides noise threshold guidelines based on the different zoning districts within the County. The proposed Project Area is zoned as conservation or agricultural by Accomack County (Accomack County Planning 2014). Accomack County thresholds do not apply to commercial or industrial operations except if noise from those operations emanates beyond the boundaries of the commercial or industrial site and affect persons who are not working onsite (Accomack County 2001). No specific noise thresholds have been established for sensitive receptors. The Accomack County Code states that noise would be deemed excessive if it "unreasonably interferes with the workings of such institution or building, provided that conspicuous signs are displayed on or near such building or institution indicating that such is a school, church, hospital, clinic, or other public building" (Accomack County 2001).

The Occupational Safety and Health Administration (OSHA) regulates workplace noise with standards for two different types of noise: constant and impulse. The OSHA limit for constant noise is 90 dBA for eight hours; however, the National Institute for Occupational Safety and Health recommends a constant noise limit of 85 dBA for eight hours to minimize occupational noise induced hearing loss. The OSHA maximum sound level for impulse noise is 140 dBA. In areas where workplace noise exceeds these sound levels, employers must provide workers with personal protective equipment to reduce noise exposure (OSHA 2019).

Noise levels continuously vary with location and time. Sound from a source spreads out as it travels from the source, and the sound pressure level diminishes (or “attenuates”) with distance. In addition to distance attenuation, air absorbs sound energy; atmospheric effects (wind, temperature, precipitation) and terrain/vegetation effects also influence sound propagation and attenuation over distance from the source. An individual’s sound exposure is determined by measurement of the noise that the individual experiences over a specified time interval.

In general, noise levels are high around major transportation corridors along highways, railways, airports, industrial facilities, and construction activities. Typical background day/night noise levels for rural areas range between 35 and 50 dBA whereas higher-density residential and urban areas’ background noise levels range from 43 dBA to 72 dBA (USEPA 1974). Background noise levels greater than 65 dBA can interfere with normal conversation, watching television, using a telephone, listening to the radio, and sleeping.

3.1.1 Affected Environment

Generally, the airborne noise environments at Wallops Island are relatively quiet. The proposed project is in a relatively remote area with infrequent vehicular or pedestrian activity. Chincoteague Island and Assateague Island National Seashore both lie northeast of the Project Area, approximately 3.2 to 4.8 km (2 to 3 mi) away. The nearest residential home (i.e., sensitive receptor) is approximately 3.7 km (2.3 mi) northeast of Walker Marsh, on Chincoteague Island. Due to its coastal location, dominant noise sources are primarily wind and wave action. In the waters surrounding Wallops Island, the primary human activities that generate airborne and underwater noise include commercial fishing, recreational boating, personal watercraft, and infrequent maintenance dredging of the Chincoteague Inlet Channel north of Wallops Island by USACE. In 2011, NASA monitored noise data at eight locations throughout WFF. The hourly sound levels showed a diurnal variation typical of background sound levels. The study determined that the background sound levels are strongly correlated with the wind conditions, with offshore breezes playing a major role in the local soundscape. Ambient noise is below 52 dB day/night average sound level (BRRC 2011, NASA 2019a).

Those activities that generate noise above ambient conditions include UAS flight operations, Navy rocket and target launches, and NASA and MARS rocket launch activities. Noise modeling of launch vehicles (LVs) conducted in 2015 during the preparation of the 2019 *Final Site-wide PEIS* (BRRC 2015, NASA 2019a) indicated that launches would create noise levels exceeding 130 dBA at the launch site, with the noise levels of approximately 115 dBA extending outward to a radius of 2.5 km (1.6 mi) from the launch site for the Liquid Fueled Intermediate Class (LFIC) LVs and almost 3 km (1.8 mi) for the Solid Fueled Heavy Class (SFHC) LVs (BRRC 2015). The noise would be intense but would be short in duration. An additional noise study was conducted in 2017

(BRRC 2017, NASA 2019a) that modeled a representative LFIC LV returning to the proposed Launch Pad 0-C on Wallops Island. The results indicate the LFIC return to launch site (RTLS) noise levels would exceed 115 dBA within a distance of approximately 0.6 km (0.4 mi) from the landing site (BRRC 2017). LFIC RTLS noise would be similar to the noise described above for a LFIC LV launch. However, a sonic boom could be generated during an RTLS supersonic descent. The results of the 2017 study indicate that the intensity of a sonic boom would be highly dependent on the RTLS actual mission trajectory and atmospheric conditions at the time of flight (BRRC 2017). As stated in the *Final Site-wide PEIS*, additional NEPA analysis may be prepared for the LFIC RTLS operations when more details are known.

Currently, there are approximately 3,900 UAS sorties, 18 orbital rocket launches, 60 sounding rockets/suborbital rockets, and 30 drone target launches per year from Wallops Island (NASA 2019a). UAS flights and rocket and drone launches occur during the day and the night. The SEL for UAS flights around the airstrip ranges from 56 dBA to 88 dBA (NASA 2012). Large rockets have the potential to produce sonic booms. Noise generated by rocket launches is short-term in duration lasting less than 10 minutes with the peak noise levels occurring within the first one to two minutes. Trajectories for rockets launched from WFF follow a predominantly southeastern course over the Atlantic Ocean. The boom footprint or "carpet," if generated, would occur over the open ocean (NASA 2009). WFF has received no noise complaints in response to UAS or launch operations (NASA 2020a).

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 (e.g., dump truck, excavator, and grader). Vehicular traffic and construction-related activities at WFF are considered minor sources of noise.

3.1.2 Environmental Consequences

Noise-related impacts would be considered significant if the Proposed Action generated noise levels that were incompatible with surrounding land uses, resulted in long-term adverse impacts at noise-sensitive receptors, or created a situation that endangered human health and safety. Potential noise impacts to ecological receptors in terrestrial and aquatic habitats, as well as marine wildlife and special-status species and marine wildlife are discussed in Sections 3.7 and 3.9, respectively.

3.1.2.1 *No Action Alternative*

Under the No Action Alternative, current baseline conditions would continue. The proposed Project Area would continue to be dominated primarily by natural sounds (wind and waves), with intermittent airborne and underwater noise sounds from commercial fishing, recreational boating, personal watercraft, and ongoing operations at WFF. Airfield operations, UAS flight operations, and rocket launch activities would continue within the documented noise thresholds. The underwater noise from individual vessels would remain the same since it is anticipated that similar types of vessels would be present in the harbor with or without the project. Thus, no new noise impacts would occur, and baseline noise conditions would continue in the airborne and underwater noise environments.

3.1.2.2 *Proposed Action: Phases 1, 2, and 3*

According to the *Final Site-wide PEIS* from which this EA is tiered, the Proposed Action is a MARS institutional support project which would provide a port, operations area, and related facilities necessary to meet existing as well as future operational missions and activities for MARS, NASA WFF, and other customers. The project would support barge access and berthing for offloading large launch vehicle components and related equipment and would also serve as a new intermodal facility as part of the MARAD M-95 Marine Highway Corridor. However, the port would be used exclusively for the transportation of space and related assets and would not be open to the public or to any commerce.

3.1.2.2.1 Construction

Construction noise is generally temporary and intermittent in nature, as it typically occurs only on weekdays and during daylight hours. Construction of the proposed pier would require two crews of 10 people. The crews would work 10 hour days, five days per week, for approximately 12 months for Phase 1, and 9.5 months for Phase 2, with a 1 to 2 year lag in between phases. Phase 1 dredging activities (turning basin and channel) would take approximately 30 days to complete, Phase 2 dredging (turning basin) would take approximately seven days, and Phase 3 dredging (turning basin and channel) would take 30 days. Dredging work would be performed 24 hours a day, seven days a week, with two crews each working 12 hour shifts.

Table 3.1-1 provides an estimate of airborne noise of construction equipment typically used for similar projects, indicating that construction-related airborne noise would range from 74 to 101 dBA when measured 15 m (50 ft) from the respective piece of equipment. Using the U.S. Department of Transportation's FHWA Road Construction Noise Model it was determined that airborne construction noise would attenuate to less than 60 dBA in approximately 2,135 m (7,000 ft) (FHWA 2006). The nearest residential home is approximately 2.3 mi (over 12,000 ft) away on Chincoteague Island, not within close enough proximity to Wallops Island to be affected by construction-related noise (BRRC 2011).Thus, airborne construction noise would be confined to within the WFF boundaries. Therefore, construction noise is unlikely to adversely alter the surrounding noise environment or impact the surrounding communities.

Construction-related noise would result from the movement of construction equipment as well as the movement of related vehicles (i.e., worker trips, and material and equipment trips) on the airstrip and surrounding roadways. The level of noise from construction-related traffic would vary depending on the phase of construction. Noise levels associated with construction traffic would increase ambient noise levels adjacent to the construction site and along roadways used by construction-related vehicles. However, the noise levels generated by construction-related traffic would be minor and temporary.

Table 3.1 1. In Air Construction Related Noise Emissions

Equipment Description	Actual Measured Lmax at 15 m (50 ft) (dBA)
Flat Bed Truck	74
Welder/Torch	74
Man Lift	75
Dump Truck	76
Paver	77
Backhoe	78
Compressor (air)	78
Slurry Plant	78
Concrete Mixer Truck	79
Drill Rig Truck	79
Front End Loader	79
Rivet Buster/Chipping Gun	79
Ventilation Fan	79
Drum Mixer	80
Roller	80
Slurry Trenching Machine	80
Vibratory Concrete Mixer	80
Concrete Pump Truck	81
Crane	81
Excavator	81
Generator	81
Pumps	81
Dozer	82
Horizontal Boring Hydraulic Jack	82
Vacuum Street Sweeper	82
Boring Jack Power Unit	83
Compactor (ground)	83
Gradall Excavator	83
Warning Horn	83
Auger Drill Rig	84
Chain Saw	84
Scraper	84
Pneumatic Tools	85
Vacuum Excavator	85
Vibrating Hopper	87
Jackhammer	89
Concrete Saw	90
Mounted Impact Hammer (hoe ram)	90
Sheers (on backhoe)	96
Impact Pile Driver	101
Vibratory Pile Driver	101

Source: FHWA 2006

Construction activities have the potential to generate temporary increases in noise levels from heavy equipment operations under the Proposed Action; however, the assumption is that no explosives or exceedingly loud practices would be needed. Typical equipment used during construction would include crane barges, material barges, tugboat, vibratory pile hammer, diesel impact hammer, concrete truck, concrete pump truck, concrete vibrator, generator, welding machines, cutting torches, and various small tools. The equipment likely to make the most noise would be the pile driver during the construction of the pier foundation.

Pile driving is necessary for pier construction, and is impulsive, but also occurs over long durations (e.g., months for installing all necessary piles). The number and type of piles driven, pile strikes per day, bottom type (i.e., composition of the bottom of the channel where a harder bottom surface would increase noise levels), and equipment used are all important in determining the level of underwater noise that would be generated. Under the Proposed Action, pier construction would require the installation of 260 piles over a period of 80 days in Phase 1 and 140 piles over a period of 45 days in Phase 2. The piles would be made of prestressed concrete, 24 inches square, and driven by a diesel impact hammer.

OSHA 8-hour thresholds (90 dBA) would be exceeded only within 53 m (175 ft) of pier construction activity. Some minor annoyance to personnel working on Wallops Island could occur from construction noise, but noise levels would be well within OSHA noise guidelines and would not present an adverse impact.

Standard efforts to minimize entry into an active construction zone, such as fencing, would create a general buffer around the area and ensure that non-construction/demolition personnel would not be exposed to unsafe noise levels (see Section 4.2). Therefore, it is unlikely that noise generated from construction activities associated with the Proposed Action would create any significant impacts to the noise environment at Wallops Island.

NASA and VCSFA would comply with local noise ordinances and state and federal standards and guidelines for potential impacts to humans caused by construction activities (e.g., hearing protection) to mitigate potential impacts on NASA, VCSFA, and construction contractor personnel.

Noise due to dredging activities would be caused by the dredging equipment, increased watercraft (tugboats and barges), and human activity. Sources of sound from dredging include machinery noise, propulsion noise, pumping noise, and aggregate noise. No blasting would be required. Airborne noise levels from clamshell dredging would be approximately 87 dBA at 15 m (50 ft) dropping to 61 dBA at 300 m (1,000 ft) and to 55 dBA at 610 m (2,000 ft) from the source and would not impact any noise sensitive human receptors.

Dredging would also produce impacts to the underwater acoustic environment. Potential impacts to marine wildlife, specifically, marine mammals and fish are discussed in Sections 3.7, 3.8, and 3.9. Underwater noise from pile driving is unlikely to create any impacts to humans.

Following completion of construction and dredging activities, the ambient sound environment would be expected to return to existing levels. Ongoing maintenance dredging is routinely performed to ensure a navigable channel and docking area. Over the past 30 years, portions of the

Chincoteague Inlet have been dredged at least once a year, removing dredge volumes of 2,290 to 94,000 m^3 (3,000 to 123,000 yd^3) over a period of one day to two months per event (USACE 2017). Since maintenance dredging of the Chincoteague Channel already occurs in the area, negligible impacts to airborne and underwater noise are anticipated.

3.1.2.2.2 Operations

During operations, the port and related facilities would provide the necessary infrastructure to transport large space assets and related cargo by utilizing the M-95 Marine Highway Corridor, reducing or eliminating the need to use the landside transportation network. Freight carrying space assets would shift from landside roads and highways to waterways, resulting in a minor beneficial impact caused by the reduction of ambient noise level to other road users. Since larger and more frequent rocket launches were contemplated as part of the *Final Site-wide PEIS*, the benefits of this reduction would be long term. While increased launch events would impact airborne levels of noise, these impacts are within previously established thresholds and addressed in other environmental reports (BRRC 2015, BRRC 2017, NASA 2019b). An increase in vessel traffic calling at the port would have no significant impact on ambient noise levels, as vessels are slow moving, and the port would be closed to public or commercial traffic. Therefore, noise impacts resulting from increased vessel traffic due to WFF program expansion would also be negligible. Overall, implementation of the Proposed Action would result in minor, temporary, adverse impacts to the ambient noise environment in the vicinity of the proposed Project Area during construction and would result in negligible or no impacts during maintenance and operations.

3.1.2.3 *Alternative 1: Phase 1 Only*

Under Alternative 1, noise impacts would be less than those described for the Proposed Action due to the shorter overall construction duration.

3.1.2.4 *Alternative 2: Phases 1 and 2 Only*

Under Alternative 2, noise impacts would be less than those described for the Proposed Action due to the shorter overall construction duration.

3.2 Munitions and Explosives of Concern (MEC)

MEC are explosive munitions, unexploded ordnance (UXO), and discarded military munitions that may pose a risk of detonation.

3.2.1 Affected Environment

Historically, Wallops Island and surrounding areas have been used for live fire and bombing operations as well as ordnance disposal areas. In addition, a 2007 study identified several areas of potential MEC including several reported UXO sites, an explosive ordnance disposal area, and two characterized UXO sites (NASA 2019a, NASA 2020b).

In 2004, NASA, the USEPA, and the Virginia Department of Environmental Quality (VDEQ) concluded that Wallops Island would be addressed by the USACE through the Formerly Used Defense Site (FUDS) program. In 2015, NASA and the USACE signed a Memorandum of Agreement that NASA would manage FUDS-related work at WFF; conducting the necessary response actions consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Defense Environmental Restoration Program using FUDS Environmental Restoration funds appropriated to the DoD. No new Military Munitions Response Program (MMRP) work would be initiated until fiscal year (FY) 2023 (NASA 2020b, NASA 2020c, USACE 2007, USACE 2015, USACE 2019, USACE 2020b, USEPA 2020).

Of the seven WFF MMRP Projects, only Project 3 - Gunboat Point, is in the Project Area. Located on the northern end of Wallops Island, this ordnance disposal area includes the boat basin and surrounding land areas, totaling 580 water ha (1,434 water ac) and 246 land ha (609 land ac), constructed and used by the U.S. Navy prior to NASA operations commencing in 1959. Use before NASA included the Gunboat Point Bombing Area, Strafing Target, Explosive Ordnance Disposal area, and Target Center. Since acquiring Wallops, NASA has limited use of this area to docking and has not used this type of ordnance. No new MMRP work would be initiated until FY 2023 (NASA 2020c, USACE 2015).

3.2.2 Environmental Consequences

Potential impacts associated with MEC are dependent on the munition or explosive component introduced to WFF or disturbed on WFF.

Because Project 3 – Gunboat Point is in the Project Area for the Proposed Action, contractor activities would require coordination and oversight to minimize potential MEC impacts. The remaining MMRP FUDS are more distant Main Base projects. As a result, under the Proposed Action, Alternative 1, and Alternative 2, contractors would be required to prepare an MEC avoidance plan and an MEC preparedness plan in coordination with the WFF Safety Office. WFF would provide education on MEC recognition and procedural protocols. In addition, a trained UXO technician would be available during geophysical survey of the construction regions and a munitions response plan would be developed for all action Alternatives.

3.2.2.1 *No Action Alternative*

Under the No Action Alternative, WFF would implement institutional support projects within the installation’s current envelope. Construction and demolition efforts under the installation’s current envelope have been covered by previous NEPA documents incorporated by reference into this tiered EA.

3.2.2.2 *Proposed Action: Phases 1, 2, and 3*

Under the Proposed Action, the new MARS Port pier would be constructed concurrently with associated infrastructure and deep channel dredging. Construction would be completed in three phases as described in Chapter 2 with approximately 24 months of active work and 1 to 2 years between phases. WFF has an active Environmental Compliance and Restoration program and USACE has not encountered MEC or UXO in the Federal Channel since at least 2015 (Personal communication with USACE). Therefore, impacts to potentially contaminated sites, areas of concern, and MECs are not anticipated under the Proposed Action. However, as the project develops, if MEC impact areas are found, safety protocols and future NEPA analysis may be required to address potential MEC impact areas (BOEM 2018, BLM 2006, NASA News 2006, NASA 2010a, SERDP 2020, USACE 2019, USEPA 2020).

3.2.2.3 *Alternative 1: Phase 1 Only*

With implementation of established safety protocols, impacts to MEC under Alternative 1 would be the same as those described for the Proposed Action.

3.2.2.4 *Alternative 2: Phases 1 and 2 Only*

With implementation of established safety protocols, impacts to MEC under Alternative 2 would be the same as those described for the Proposed Action.

3.3 Health and Safety

WFF health and safety concerns include both occupational and public health concerns among all WFF activities including waste collection and disposal.

3.3.1 Affected Environment

Health and safety measures at WFF include occupational hazards; potential hazards from fire, crash, and rescue emergency operations; and from rocket assembly, handling, and fueling operations. VCSFA reviews contractor safety plans for VCSFA contractors. In addition to reviewing contractor safety plans, the WFF Safety Office provides policies and procedures to protect the public, personnel, and property, and ensures that their tenants follow these policies. Potential hazards associated with WFF activities are minimized through established safety control measures including safety training, exclusion zones, proper handling, and personal protective equipment (NASA 2012).

The WFF Safety Office also manages the WFF Fire Department with fire stations on the main base and on Wallops Island. Both are staffed with fully trained firefighters and emergency medical technicians providing support for normal, as well as rescue and emergency, operations. WFF also has a fully equipped first aid and emergency treatment facility in Building F-160 staffed with a physician and nurse during normal daily work hours (NASA 2012).

The WFF Fire Department has a Mutual Aid Agreement with the Accomack-Northampton Firemen's Association providing outside assistance as needed at WFF and promoting emergency services to neighboring Virginia communities including Chincoteague, Atlantic, and New Church (NASA 2019a).

By providing the security of WFF, the Protective Services Division ensures the safety of personnel, property, and the public. The WFF security force manages internal security of the base; providing 24-hour per day protection services. Entry onto the facility is restricted with gates used to control and monitor employee and visitor traffic. Entry onto the Main Base is restricted through entry control points at the main entrance gate to WFF, an entrance gate to NOAA Wallops Command and Data Acquisition Station, and an entrance gate to the U.S. Navy controlled property at WFF. A single gate for the Mainland and Wallops Island provides a monitoring and control point. In addition to police services, the security force also provides security patrols, employee and visitor identification, afterhours security checks, and mission driven safety cordon maintenance. Badges are provided to all WFF personnel, contractors, range users, tenants, and visitors. Only authorized persons are permitted to enter potentially hazardous areas of the facility (NASA 2019a, NAVSEA 2020, USN 2017).

3.3.2 Environmental Consequences

Impacts presenting a substantial or potential hazard to the public or to personnel would be analyzed. Because WFF security would be adjusted and implemented to ensure public, personnel, and property safety, facility security would not be adversely affected regardless of chosen Alternative and, therefore, will not be further analyzed.

3.3.2.1 *No Action Alternative*

Under the No Action Alternative, WFF would implement institutional support projects within the installation's current envelope. Health and safety concerns from construction and demolition efforts under the installation's current envelope have been covered by previous NEPA documents incorporated by reference into this tiered EA.

3.3.2.2 *Proposed Action: Phases 1, 2, and 3*

Under the Proposed Action, the new pier would be constructed concurrently with associated infrastructure and deep channel dredging. Construction would be completed by VCSFA contractors in three phases as described in Chapter 2 with approximately 24 months of active work and 1 to 2 years between phases. By constructing the MARS port and operations area, the Project would increase safety through upgrades and enhancements to roads and approach channels along with the new pier, support buildings, utilities, and parking facilities.

Project specific health and safety plans would be developed for all phases of the proposed project. Safe construction and demolition standard operating practices (SOPs) would be followed. Safety Officers would be designated, regular inspections performed, and compliance documented. Safety briefings would occur on all levels over the life of the Project. Emergency plans, procedures, and contacts would be documented along with locations of first aid stations, emergency transport, and local emergency facilities (see Section 4.2).

Construction and demolition activities would be performed by qualified personnel. All activities would be conducted in accordance with federal and state OSHA regulations. Federal contractors would follow regulations defined in Federal Acquisition Regulation 52.236-13, *Accident Prevention*. As appropriate, signage, signal lights, and fencing would be placed to alert workers, pedestrians, and motorists of project activities. Traffic changes would be marked with sufficient warning and signage. As VCSFA contractors would perform the proposed construction activities, VCSFA would review and approve the contractor health and safety plans prior to receiving clearance to work onsite. The pre-construction meeting between NASA, VCSFA, and all contractors and subcontractors would include a safety briefing. With these preventive measures in place (see Section 4.2), negligible impacts to health and safety are anticipated from construction and demolition activities under the Proposed Action (NASA 2019a).

Dredging the access channel in these federal navigable waters would be performed with the appropriate USACE permit. Notices-to-Mariners (NOTMARs) would be issued to warn boaters in the vicinity to proceed with caution for the duration of the pier construction and dredging operations. Public signage, as appropriate, would be placed around the pier, turning basin, and dredging areas to alert the public of project. In addition to these safety measures for the proposed construction, established protocols and safety measures for operations at WFF would continue to be observed, and no significant or potential health and safety impacts are anticipated under the Proposed Action.

3.3.2.3 *Alternative 1: Phase 1 Only*

As described for the Proposed Action, with implementation of project-specific health and safety plans and safe construction SOPs, negligible impacts to health and safety are anticipated from construction and demolition activities under Alternative 1.

3.3.2.4 *Alternative 2: Phases 1 and 2 Only*

As described for the Proposed Action, with implementation of project-specific health and safety plans and safe construction SOPs, negligible impacts to health and safety are anticipated from construction and demolition activities under Alternative 2.

3.4 Land Resources

Land resources for this EA describe the physical surface characteristics such as topography, geology, and soils in the affected land areas.

3.4.1 Affected Environment

3.4.1.1 *Topography*

The topography at WFF is typical of the Mid-Atlantic coastal region, generally low-lying with elevations ranging from sea level to 15 m (50 ft) above mean sea level (MSL). Wallops Island is separated from the Mainland by various inlets, marshes, bays, creeks, and tidal estuaries. During storms, flood water from the Atlantic Ocean moves through these inlets and across the marshes to low-lying areas (NASA 2017). Elevation at the UAS Airstrip area ranges from 1.2 m (4 ft) above MSL to 1.8 m (6 ft). This area has been built up with fill during construction of the runway.

3.4.1.2 *Geology*

Located within the Atlantic Coastal Plain Physiographic Province, WFF is underlain by approximately 2,100 m (7,000 ft) of sediment overlying crystalline basement rock. The sedimentary section, ranging in age from Cretaceous to Quaternary, consists of a thick sequence of terrestrial, continental deposits overlain by a much thinner sequence of marine sediments. The two uppermost stratigraphic deposits at WFF are the Yorktown Formation and the Columbia Group, which is not subdivided into formations. The Yorktown Formation is the uppermost unit in the Chesapeake Group and generally consists of fine to coarse, glauconite quartz sand. The overlying Columbia Group are generally unconsolidated deposits of clay, silt, sand, and gravel (NASA 2017).

Two geotechnical investigations over three different field efforts were performed to determine subsurface conditions at the site. The first investigation was performed during November 2020 and January 2021 and was concentrated on the turning basin/channel deepening and dredging area and the pier area. A total of sixteen borings were drilled at the site. Boring L-1, a land test boring, was drilled to a depth of 28 m (90.5 ft) below ground surface (bgs). Borings P-1 through P-5, pier test borings, were drilled to a depth of between 28 and 37 m (90.5 and 120.5 ft) bgs. Borings D-2, D-4, D-6, D-9, D-11, D-13, D-15, channel deepening borings, were drilled to a depth of 1.2 to 5.5 m (4 to 18 ft) below the existing grade. Borings E-2, E-4, and E-7, dredging test borings, were drilled to a depth of 2.4 m (8 ft) bgs. Soils were visually classified using the Unified Soil Classification System. Subsurface soils consisted of interbedded layers of sand, silty sand, clayey silt, clayey organic silt, clay and silt, clay, silty clay, and fat clays. At boring L-1, the land test boring, groundwater was encountered at a depth of 0.9 m (3 ft) bgs. Boring P-1 was drilled at the edge of the Bay, and thus groundwater was at zero. The rest of the borings were drilled off a barge in the bay. Water depths ranged from 0.7 to 5 m (2.25 to 16 ft) (Hynes 2021a).

The field data was supplemented with laboratory testing data, including moisture content tests and particle size distribution tests (hydrometer tests and Atterberg Limits). Two Shelby tubes were collected, and the following tests were conducted on the contents: unconfined compressive strength, unit weight determination, moisture content, and Atterberg Limits testing. Testing did not indicate any adverse subsurface conditions that would preclude construction.

The second investigation was conducted February 2021 and was concentrated on the land portion of the project, specifically the access road, culvert replacement area, and hanger area. A total of 13 test borings (B-3 through B-15) were drilled at the site in the vicinity of the proposed access road, proposed parking area, the relocated culvert, and the proposed hangar. Borings B-3 through B-9, along the proposed access road, were drilled to a depth of 1.5 m (5 ft) bgs. Boring B-10 (proposed parking area) was drilled to a depth of 6 m (20 ft) bgs. At the proposed hangar building location borings B-13 and B-15 were drilled to a depth of 6 m (20 ft) bgs, and boring B-14 to a depth of 15.4 m (50.5) ft bgs. At the location of the proposed culvert, borings B-11 and B-12 were drilled to a depth of 15.4 m (50.5) ft bgs. Subsurface soils consisted of interbedded layers of sand, silty sand, silt, and silty clay. Groundwater was encountered at depths varying from 0.3 to 1.4 m (1 to 4.5 ft) bgs. Additionally, a seismic site classification was performed, and the seismic classification for the site was determined to be Classification “E” (Hynes 2021b).

The field data was supplemented with laboratory testing data, including: Atterberg Limits, sieve analysis, and natural moisture content tests. Testing did not indicate any adverse subsurface conditions that would preclude construction.

3.4.1.3 *Soils*

Soils at the northern end Wallops Island vary and are high in sand content, resulting in a highly leached condition, an acidic pH, and a low natural fertility. There are six separate soil types within the areas where the various components of the Proposed Action would be located. A list of these soils and their characteristics is provided in **Table 3.4-1**.

Table 3.4 1. Soils in the Vicinity of the Proposed Action

Soil Type	Slope	Drainage Class	Erosion Potential	Flooding Potential
Assateague fine sand	2-35 percent	Excessively drained	Moderate	Rare
Beaches	1-5 percent	Variable	High	Frequent
Camocca fine sand	0-2 percent	Poorly drained	Low	Frequent
Chincoteague silt loam	0-1 percent	Very poorly drained	High	Frequent
Fisherman-Assateague complex	0-35 percent	Moderately well drained	Moderate	Frequent
Fisherman-Camocca fine sands complex	0-6 percent	Moderately well drained	Moderate	Frequent

Source: NRCS 2020

The UAS Airstrip area has been previously disturbed during construction of the runway, and most of the Project Area includes fill to varying depths.

3.4.2 Environmental Consequences

Impacts to land resources would be considered significant if major changes to topography or underlying geology occurred. This would involve the alteration of unique geologic formations or creating a situation that would cause the degradation or irreparable damage to natural landforms, topography, or exceptional loss of soils through erosion.

3.4.2.1 *No Action Alternative*

Under the No Action Alternative, no further development activities on the northern end of Wallops Island would occur beyond those activities that are already occurring. Therefore, there would be no project-related impacts to topography, geology, or soils.

3.4.2.2 *Proposed Action: Phases 1, 2, and 3*

Under the Proposed Action, minor changes to topography would occur in areas that would be graded for new construction. Temporary excavations would be filled upon completion of the project and re-contoured to pre-disturbance elevations. Pilings for the pier would be drilled or hammered into the bedrock below the water surface. However, there would be no adverse impacts to the underlying geology. Some of the MARS Port components would occur on previously disturbed land (e.g., Project Support Building); however, some construction would occur on previously undisturbed land (e.g., Second Hangar). Construction activities have the potential to cause soil erosion; therefore, a site-specific Erosion and Sediment Control (ESC) Plan would be developed and utilized to ensure that soil erosion during construction is minimal. This plan would outline Best Management Practices (BMPs) to be implemented. These BMPs could include 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 (see Section 4.2).

If the dredged material is suitable, reuse for shoreline renourishment and shoreline infrastructure protection would have a minor impact on topography and soils based on the amounts of material and the specific placement locations. Under the Proposed Action the total volume of dredged material is estimated to be 72,000 m^3 (94,200 yd^3). For the initial Phase 1 dredging, the dredge materials would be placed in the North Wallops Island Beach Borrow Area. For the Phase 2 and Phase 3 dredging and future maintenance dredging, the material would be placed somewhere within the SERP area, which could include shoreline beach placement or the borrow area. Beach placement would result in stabilization of the shoreline and changes to the existing beach profile. The new beach profile would continue to adjust due to the minor changes in the dredged material sediment size, local wind and wave climate, and tidal action.

3.4.2.3 *Alternative 1: Phase 1 Only*

Potential impacts on land resources would be the same as those described for the Proposed Action except that the total volume of dredged material requiring placement would be less. For Alternative 1, the total volume of dredged material is estimated to be a maximum of 42,500 m^3 (55,600 yd^3) per dredge cycle.

3.4.2.4 *Alternative 2: Phases 1 and 2 Only*

Potential impacts on land resources would be the same as those described for the Proposed Action except that the total volume of dredged material requiring placement would be less. For Alternative 2, the total volume of dredged material is estimated to be a maximum of 43,100 m^3 (56,400 yd^3) per dredge cycle.

3.5 Water Resources

Water resources for this EA refer to surface and subsurface waters, wetlands, estuarine and tidal waters, floodplains, and the coastal zones that exist in and around WFF. The CWA of 1972, as amended, is the primary federal law that protects the nation's waters, including lakes, rivers, aquifers, and coastal areas. In addition, Section 10 of the Rivers and Harbors Act (33 United States Code [U.S.C.] 403) prohibits the obstruction or alteration of navigable Waters of the United States without a permit from the USACE. The significance of potential impacts to water resources is determined by actions that have large scale adverse impacts on the hydrologic function of the 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.

Lastly, this project is within the vicinity of the Chincoteague Inlet Federal Navigation Project which is a USACE federally authorized civil works project pursuant to 33 U.S.C. 408 (Section 408). The USACE Norfolk District will review the Project in accordance with Engineering Circular 1165-2-220 to make a determination as to whether the proposed action is injurious to the public interest or affects the ability of the Federal Navigation project to meet its authorized purpose. Following the review, the USACE will make a 408 Determination as to whether the proposed alteration, occupation, or use of the federal project is approved or denied.

The CWA Section 404 and Rivers and Harbors Act Section 10 permit, and the U.S.C. Section 408 permission would be applied for through the Standard Joint Permit Application (JPA) process in Virginia.

3.5.1 Surface Waters and Stormwater Management

Virginia Stormwater Management Program (VSMP) regulations (9 Virginia Administrative Code [VAC] 25-870), administered by the VDEQ, 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 ha (1 ac) or greater, develop a Stormwater Pollution Prevention Plan (SWPPP) and acquire a permit (9 VAC 25-880) from the VDEQ prior to construction.

The VDEQ designated the surface waters in the vicinity of WFF as Class I–Open Ocean and Class II–Estuarine Waters. Surface waters in Virginia are subject to the water quality criteria specified in 9 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 addition, surface waters must meet the 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 WFF, the saltwater numerical criterion is applied. Both sets of standards are used by the Commonwealth of Virginia to protect and maintain surface water quality.

3.5.1.1 *Affected Environment*

The Project Area on Wallops Island falls within the Upper Chesapeake subregion watershed and within the Chincoteague sub-basin. The northern boundary of Wallops Island is formed by Chincoteague Inlet and its western side is bounded by a series of water bodies that include (from north to south) Ballast Narrows, Bogues Bay, Cat Creek, and Hog Creek, which separate the Island from the Mainland (**Figure 3.5-1**). No natural perennial streams or ponds exist on Wallops Island; however, stormwater management ponds have been created on the island and intermittent water bodies may form after storms or in response to other physical forces such as tides (NASA 2019a). Surface waters in the UAS Airstrip area drain north and west to Cow Gut via an unnamed tidal creek or directly into the Ballast Narrows. The UAS Airstrip is surrounded by a subsurface drainage system; this gravel-filled infiltration trench captures the surface water runoff from the runway and directs it offsite. Surface water in the vicinity of the proposed North Island Operations Center flows into one of the tidal channels of Sloop Gut.

3.5.1.2 *Environmental Consequences*

3.5.1.2.1 No Action Alternative

Under the No Action Alternative, no further development activities on the northern portion of Wallops Island would occur beyond activities that are already occurring. Therefore, there would be no project related impacts on stormwater management or to any surrounding surface waters.

3.5.1.2.2 Proposed Action: Phases 1, 2, and 3

The Proposed Action could potentially result in impacts on the water quality of surface waters in the following ways:

- Land disturbance and subsequent erosion and sedimentation from stormwater runoff
- Sedimentation in estuarine waters from disturbances of the subaqueous bottom (e.g., pile driving and dredging)
- Contamination from leaks and spills of pollutants during construction

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. Construction of the second hangar would require modifications of the existing subsurface drainage system that surrounds the UAS Airstrip. Also, the proposed parking area would result in a long-term increase in surface water runoff to the surrounding area because of the new impervious surface.

Figure 3.5-1 Surface Waters Surrounding Northern Wallops Island

The UAS Airstrip access road perpendicularly intersects a stream via a culverted crossing. The culverted crossing consists of a 61 centimeter (cm) (24 inch [in]) diameter corrugated pipe that hydrologically connects the stream on both sides of the roadway. The stream is subtidal and exhibits water flowing in conjunction with the tides. The stream contains an unconsolidated bottom, which is continuously covered by tidal salt water. The roadway would be widened on the west side only, with a matching diameter extension of the culvert spliced to the existing culvert to lengthen the culvert beneath the new roadbed. In order to maintain hydraulic flow, if necessary, a larger culvert would be spliced and countersunk at least 15 cm (6 in) below the streambed. Therefore, no changes are anticipated to the hydraulic function of the stream.

To minimize potential short-term and long-term impacts, NASA/VCSFA would obtain a VSMP construction site stormwater permit, develop a site-specific SWPPP, and implement site specific BMPs (summarized in Section 4.2). 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.

Pile driving activities for construction of the new pier would use equipment, such as tugboats, barge mounted cranes, construction crew support vessels, and pile driving equipment, with the potential to cause increased temporary turbidity in shallow areas during pile driving activities. The pile driving activity could also result in increased turbidity from the pressure of the blows to the piles to drive the piles down into the channel bottom. This would result in water column disturbance by way of re-suspension of bottom sediments and cause underwater noise disturbance to fish and marine mammals from elevated sound generated in the water column (see Sections 3.8 and 3.9). It is anticipated that these impacts would be temporary and localized to the area directly around each pile installed or removed.

Proposed dredging operations would likely cause sediment to be suspended in the water column. Studies of past similar projects specify that the extent of the sediment plume is normally limited to between 1,600 to 4,000 ft (490 to 1,200 m) from the dredge operation and that elevated turbidity levels are usually short term, approximately an hour or less (NASA 2013). The length and shape of the plume depends on the hydrodynamics of the water column and the sediment grain size. If the dominant substrate in the proposed approach channel and turning basin is fine to medium sand, it is expected to settle more rapidly and cause less turbidity and oxygen demand than finer-grained sediments. No appreciable effects on dissolved oxygen, pH, or temperature are anticipated because the dredged material typically has low levels of organics and low biological oxygen demand.

The primary physical impact from mechanical dredging involves a re-suspension of sediments and increased turbidity that could adversely affect marine life and water quality. Sediment loss to the water column reduces the efficiency of the dredging process, increases the size of the residual sediment plume, and compounds the impacts to the marine environment.

The nature, degree, and extent of sediment re-suspension that occurs during dredging operations are controlled by many factors including: the particle size distribution, solids concentration, and composition of the dredged material; the dredge type and size, operational procedures used; and finally, the characteristics of the receiving water in the vicinity of the operation, including density, turbidity, and hydrodynamic forces (e.g., waves, currents) causing vertical and horizontal mixing. The relative importance of the different factors varies significantly from site to site (Science Applications International Corporation [SAIC] 2001). Shoal material removed from channel dredging would likely include coarse material, limiting the re-suspension of materials and turbidity in the water column. Dredging in the barge basin is likely to include finer material combined with coarse materials and increase the likelihood of increased turbidity levels during dredging.

Even under ideal conditions, substantial losses of loose and fine sediments usually occur with mechanical dredging. Sediment loss during a typical mechanical bucket dredging operation occurs throughout the water column from the following specific sources: impact of the bucket on the bottom of the dredge area; material disturbance during bucket closing and removal from the bed; material spillage from the bucket during hoisting; material washed from the outer surfaces of the bucket during hoisting; leakage and dripping during bucket swinging; aerosol formation during bucket reentry; and residual material washed during bucket lowering (SAIC 2001).

Maximum concentrations of suspended solids in the surface turbidity would occur in the immediate vicinity of the dredging areas and decrease rapidly with distance from the operation due to settling and dilution of the material. An array of operational turbidity control measures could be implemented to prevent suspended sediments from exceeding water quality standards. Frequent monitoring would be performed during dredging to ensure the effectiveness of the selected suspended sediment control methods. Examples of operational controls for dredges are included in **Table 4-1**. For example, turbidity curtains (also referred to as sediment curtains) could be employed when dredging in sensitive areas. If the use of turbidity curtains is not possible due to current velocities, dredging would be conducted during slack tides (i.e., on the western portion of the channel during flood tide and the eastern portion of the channel during ebb tides).

Application of operational controls is potentially costly and can significantly reduce overall production rates and efficiency. Further, the improper use of controls can have direct negative impacts on a project and the environment by concentrating total suspended solids in a localized area, reducing visibility, and potentially reducing localized dissolved oxygen. The degree of controls needed is a site-specific or area-specific decision. Therefore, such controls should be applied only when conditions clearly indicate their need and should not be set as a requirement solely because they can be applied (USACE 2005). With proper monitoring as established by the Joint Permit (see Section 3.5.3), the potential for the dredging project to have significant water quality impacts would be minor. Any exceedances of water quality standards would result in the interruption of the construction activities until the total suspended solids levels returned to acceptable levels. The sedimentation controls would prevent significant impacts to aquatic communities and water quality outside of the Project Area.

In a 1979 study, Bohlen, et al., determined that the total suspended load in an estuarine system after a storm event is an order of magnitude greater than that produced by dredging activities (e.g., bucket load leakage, dredge-induced plume). The study also detected that sediment concentration along the centerline of the dredge-induced plume decreased rapidly to background levels within 700 m (2,300 ft) (Bohlen et al. 1979). Therefore, the turbidity generated by sediment dredged along the vessel access channel and turning basin would have a short suspension time during dredging, transport, and disposal or reuse of the material in the dredged material placement site.

Potential short-term minor impacts on nearshore water quality could result from the accidental release of petroleum products, or other contaminants, from construction vehicles and heavy equipment used during onshore or offshore construction activities, dredging, and dredged material disposal. Impacts could range from negligible to adverse depending on the size of the release and how quickly it could be controlled and cleaned up. The potential for such construction-related impacts to occur would be minimal as contractors would implement BMPs for vehicle and equipment fueling and maintenance as well as WFF's Integrated Contingency Plan (ICP) and site-specific spill prevention and control measures (see Section 4.2). With these measures in place, adverse impacts are anticipated to be localized and effects would not be long-term.

3.5.1.2.3 Alternative 1: Phase 1 Only

Potential impacts on surface waters and stormwater management would be similar but less than those described for the Proposed Action. Under Alternative 1, the fixed pier would only be constructed to a final length of 190 m (624 ft), which would result in less sediment disturbance and turbidity. The total amount of dredging would also be less than under the Proposed Action. For Alternative 1, the total volume of dredged material is estimated to be 42,500 m^3 (55,600 yd^3).

3.5.1.2.4 Alternative 2: Phases 1 and 2 Only

Potential impacts on surface waters and stormwater management would be similar but less than those described for the Proposed Action and only slightly greater than Alternative 1. Under Alternative 2, the fixed pier would be extended to a final length of 398 m (1,305 ft). The total amount of dredging would be less than under the Proposed Action and only slightly greater than Alternative 1. For Alternative 2, the total volume of dredged material is estimated to be 43,100 m^3 (56,400 yd^3).

3.5.2 Groundwater

Groundwater is subsurface water that occupies the space between sand, clay, and rock formations. Groundwater, an essential resource in many areas, is used for water consumption, agricultural irrigation, and industrial applications. Groundwater properties are often described in terms of depth to aquifer, aquifer or well capacity, water quality, and surrounding geologic composition. Aquifers are areas of mostly high porosity soil where water can be stored between soil particles and within soil pore spaces.

3.5.2.1 *Affected Environment*

WFF receives its potable water from seven groundwater supply wells that are located at the Main Base and the Mainland. There are no groundwater supply wells within or near the Project Area.

The Columbia and Yorktown-Eastover multi-aquifer system lie under the Eastern Shore and are designated and protected by the USEPA as a sole-source aquifer (USEPA 2019). The Columbia aquifer, the uppermost aquifer, is unconfined, and primarily comprised of saturated, sandy, surficial sediments (Accomack-Northampton Planning District Commission and the Eastern Shore of Virginia Groundwater Committee 2013). The Yorktown-Eastover aquifer system consists of alternating sand and clay-silt units. Section 3.5.1.4 of the *Final Site-wide PEIS* notes that at WFF, the Columbia aquifer occurs between depths of approximately 2 to 18 m (6 to 60 ft) bgs, and the shallow water table is generally 0 to 9 m (0 to 30 ft) bgs. The top of the shallowest confined Yorktown-Eastover aquifer at WFF is found at depths of approximately 30 m (100 ft) bgs. It is separated from the overlying Columbia aquifer by a 6 to 9 m (20 to 30 ft) confining layer (aquitard) of clay and silt. In the Wallops area, the lower Yorktown-Eastover aquifer contains the freshwater/saltwater interface, which occurs at a depth of approximately 90 m (300 ft) below MSL. This freshwater/saltwater interface prevents the lower Yorktown-Eastover from being used as a portable water source (NASA 2019a).

Depth to groundwater in the UAS Airstrip area is expected to be within 0.9 to 1.5 m (3 to 5 ft) bgs. The water table in the Project Area is tidally influenced and can vary daily and seasonally.

3.5.2.2 *Environmental Consequences*

3.5.2.2.1 No Action Alternative

Under the No Action Alternative, no further development activities on the northern portion of Wallops Island would occur beyond activities that are already occurring. Therefore, there would be no project related impacts to groundwater.

3.5.2.2.2 Proposed Action: Phases 1, 2, and 3

Given the shallow depth to groundwater across the Project Area, de-watering may be required for any excavations that may be needed for facility and associated infrastructure construction. De-watering could result in highly localized and temporary lowering of surficial groundwater levels in the immediate vicinity of the excavated area. Groundwater levels should quickly (i.e., within several hours) return to pre-disturbance levels. Impacts would be temporary, and the de-watering activities would be performed in accordance with approved BMPs and VSMP and CWA permit conditions.

Groundwater contamination could occur from an inadvertent spill of fuel or hazardous liquids from construction equipment and vehicles. Hazardous liquids and materials would be stored and handled according to the ICP and the VSMP permit conditions. In accordance with these plans, NASA, VCSFA and their contractors would immediately implement control and clean-up measures in the event of an inadvertent release of petroleum-based or hazardous materials to prevent groundwater contamination (see Section 4.2). With the implementation of spill prevention measures, no adverse short-term or long-term effects to groundwater resources are anticipated.

3.5.2.2.3 Alternative 1: Phase 1 Only

Potential impacts on groundwater resources would be the same as those described for the Proposed Action.

3.5.2.2.4 Alternative 2: Phases 1 and 2 Only

Potential impacts on groundwater resources would be the same as those described for the Proposed Action.

3.5.3 Wetlands

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 1979). Wetlands consist of three mandatory technical parameters: a prevalence of hydrophytic vegetation, hydric soils, and wetland hydrology field indicators.

The CWA of 1972 is the primary federal law that protects the nation's waters, including coastal areas and Waters of the United States. The primary objective of the CWA is to restore and maintain the integrity of the nation's waters. Section 404 of the CWA established a permit program to regulate the discharge of fill material into Waters of the United States and to minimize adverse effects on the aquatic environment. The USACE is responsible for day-to-day administration and permit review while USEPA provides program oversight.

EO 11990, *Protection of Wetlands*, 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. Projects that impact wetlands require a CWA permit. For tidal wetlands in Virginia, a JPA is filed with Virginia Marine Resources Commission (VMRC), which serves as the clearinghouse for federal, state, and local levels of permit review. JPAs submitted to VMRC receive independent yet concurrent reviews by USACE, VMRC, VDEQ, and the Accomack County Wetland Board, respectively. Prior to any activity that would occur in-water or impact wetlands, NASA and VCSFA would submit a JPA for this project to the VMRC. NASA wetland regulations (14 CFR 1216.1) outline the required procedures for evaluating actions taken by NASA which impact wetlands.

3.5.3.1 *Affected Environment*

On July 28 and August 31, 2020, AECOM conducted wetland field investigations. The approximate 6 ha (14 ac) field investigation Study Area is in proximity to the existing UAS Airstrip at the northern end of Wallops Island. Two potentially regulated wetlands were identified within the Study Area through the field investigation (Wetland A and Wetland B). Additionally, on January 13, 2021, COVA Environmental completed a wetland delineation around the area of the UAS Airstrip access road improvement (including culvert widening). One tidal estuarine stream (EUB) and one estuarine wetland (Wetland C, EEM) were identified. **Figure 3.5-2** shows the locations of the three wetlands and tidal stream delineated within the Project Footprint. No wetlands were present at the proposed site of the Project Support Building. These features are described in **Table 3.5-1**. Estuarine emergent wetlands are tidal wetlands with salinities exceeding 0.5 parts per thousand, and at least partially enclosed by land. Vegetation is dominated by erect, rooted, herbaceous, usually perennial, plant species. In the estuarine marshes of the Project Area, dominant species include saltmarsh cordgrass (*Spartina alterniflora*) in the low marsh zone and saltmeadow hay (*Spartina patens*) in the high marsh. Unconsolidated bottoms are characterized by vegetation prevalence less than 30 percent and a lack of large stable surfaces for plant and animal attachment. AECOM's Wetlands and Waters Delineation Report (**Appendix B**) was submitted to USACE on December 2, 2020, and COVA Environmental's Wetlands Delineation Report (**Appendix B**) was submitted to USACE on February 4, 2021. USACE preliminary jurisdictional determinations have been received for all wetlands.

Table 3.5 1. Summary of Wetland Features in the Study Area

Feature	Tidal / Non-tidal	Cowardin Classification*	Linear Feet	Area (m^2 / ft^2)	Area (ha / ac)
Wetland A	Tidal	Estuarine Emergent Wetland (EEM)	-	6,189 / 66,618	0.62 / 1.53
Wetland B	Tidal	EEM	-	14,411 / 155,119	1.44 / 3.56
Wetland C	Tidal	EEM	-	2,100 / 22,608	0.21 / 0.52
Stream	Tidal	Estuarine Stream (EUB)	151	-	-
Total			**151**	**22,700 / 244,345**	**2.27 / 5.61**

*Cowardin classification based on information from USFWS's National Wetlands Inventory mapper, AECOM's July and August 2020 wetland delineations, and COVA Environmental's January 2021 wetland delineation

Figure 3.5-2. Northern Wallops Island Wetlands

3.5.3.2 *Environmental Consequences*

3.5.3.2.1 No Action Alternative

Under the No Action Alternative, no further development activities on the northern portion of Wallops Island would occur beyond activities that are already occurring. Therefore, there would be no project related wetland impacts.

3.5.3.2.2 Proposed Action: Phases 1, 2, and 3

The proposed MARS Port components at the UAS Airstrip have been designed to avoid and/or minimize impacts to wetlands to the maximum extent practicable. However, culvert improvements for widening of the UAS Airstrip access road, port access road, and the approach pier from the end of the port access road would result in permanent and temporary wetland impacts. A summary of the temporary and permanent impacts on wetlands associated with the Proposed Action is shown in **Table 3.5-2**.

Table 3.5 2. Direct Wetland Impacts for the MARS Port

Impact Area	Feature	Temporary Impact (ha / ac)	Permanent Impact (ha / ac)
Port Access Road	Wetland A	0.35 / 0.86	0.02 / 0.05
Approach Pier	Wetland B	0.24 / 0.59	0.12 / 0.30
Culvert Improvement	Wetland C	<0.07 / <0.18	<0.01 / <0.01
Culvert Improvement	Stream	<0.01 / <0.01	<0.01 / <0.01
	Total	**0.67 / 1.64**	**0.16 / 0.37**

Permanent impacts would result from the conversion or removal of the affected wetland area. Areas of *Spartina* marsh beneath the pier would be shaded, and this linear area of marsh likely would be permanently impacted by limited sunlight that would result in reduced vegetation density.

Temporary direct impacts could include rutting, soil compaction, and vegetation damage from the placement and removal of matting, along with equipment movement and use during the construction activities. The area of temporary impact was determined by assuming a 30-ft buffer area around the area of permanent impact. Areas of temporary disturbance would be restored to the extent practicable after the construction activities are complete. Synthetic composite mats, used as temporary vehicle “roadways,” would be placed in areas of ground-disturbing activities to the extent practicable to minimize adverse impacts on wetlands. Disturbed surfaces of the wetlands would be removed in layers and replaced in the order they are removed. Layers would be hand smoothed and, once work was completed, any bare areas would be seeded with a native seed mix or plugs comprised of species observed at the site. Temporarily disturbed wetlands would be restored to pre-construction conditions to the greatest extent practicable (see Section 4.2).

Temporary impacts to tidal wetlands (vegetated and un-vegetated) would be mitigated by restoring wetland vegetation in areas where the degree of disturbance to plants would hinder natural revegetation from the existing root mat. Soils, substrate, and contours would be restored to pre-construction conditions to the extent practicable and would re-establish native vegetation within 30 days from the completion of activities.

Dredging of the new channel and basin may result in the loss of shallow water habitat (i.e., 2 meters [6.5 ft] or less below low water). Shallow water provides high primary production by benthic microalgae, nutrient regeneration, decomposition of organic matter, secondary production by benthic invertebrates, feeding habitat and predation refuges for post-larval fish and invertebrates, and feeding habitat for shore birds and wading birds. Dredging to depths deeper than 2 meters (6.5 ft) can, therefore, result in loss of primary production, refuge habitat, benthic communities, and sediment suspension (Ray 2005). Potential impacts to shallow water resulting from the Proposed Action would be addressed in the JPA, along with potential minimization or compensation measures as appropriate (**Table 4-1**).

Any required CWA permits from the USACE, VMRC, Accomack County Wetlands Board, and/or VDEQ (see Section 4.1) would be obtained prior to start of any construction. Specific wetland permits could also include requirements for mitigation and/or monitoring. Section 4.2 includes BMPs, general mitigation measures, and monitoring measures to minimize long-term impacts to the affected wetlands.

Mitigation of wetland impacts always occurs in the following order: avoidance, minimization, and lastly compensatory mitigation for unavoidable impacts. The order for compensatory mitigation is generally banking credit purchase, in-lieu fee credit purchase, permittee-responsible mitigation. NASA will follow the 2008 Compensatory Mitigation Rule under CWA Section 404 including the use of USACE approved mitigation banks, in-lieu fee programs, and permittee-responsible mitigation.

Currently, however, there are no USACE approved mitigation banks on the Eastern Shore of Virginia. NASA and VCSFA have consulted with VDEQ and The Nature Conservancy in Virginia for use of the Virginia Aquatic Resources Trust Fund (VARTF). VARTF is an In-Lieu Fee (ILF) mitigation program which acquires stream and wetland conservation projects throughout Virginia and is administered in partnership with the USACE, VDEQ, and The Nature Conservancy. Generally, VARTF consolidates money (fees) 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. If VARTF credits are not available, NASA and VCSFA would undertake permittee-responsible mitigation either on- or off-site to compensate for unavoidable impacts. The final mitigation plan would be compliant with the terms of the 404 permit.

3.5.3.2.3 Alternative 1: Phase 1 Only

Under Alternative 1, potential wetland impacts and compliance with EO 11990 would be the same as described for the Proposed Action.

3.5.3.2.4 Alternative 2: Phases 1 and 2 Only

Under Alternative 2, potential wetland impacts and compliance with EO 11990 would be the same as described for the Proposed Action.

3.5.4 Floodplains

Floodplains are lowland areas located adjacent to bodies of water in which the ordinary high-water level fluctuates on an annual basis. EO 11988, *Floodplain Management*, requires federal agencies to minimize occupancy and modification of the floodplain. Flood Insurance Rate Maps (FIRMs) are produced by the Federal Emergency Management Agency (FEMA) and delineate the scope of potentially affected floodplains in the Project Area.

3.5.4.1 *Affected Environment*

According to the FIRMs, all of Wallops Island is within a special flood hazard area subject to inundation by the 1 percent annual chance flood. The 1 percent annual flood (100-year flood), also known as the base flood, is the flood that has a 1 percent chance of being equaled or exceeded in any given year. The Project Area is included on FIRM Community Panels 51001C0265G and 51001C0270G. Areas of special flood hazard for Wallops Island include Zones AE and VE. Most of the interior portions of Wallops Island are mapped as Zone AE. Zone AE is defined as having base flood elevations that have been determined by detailed methods. Zone VE is defined as a coastal flood zone with additional hazards associated with storm-induced waves (FEMA 2015).

3.5.4.2 *Environmental Consequences*

3.5.4.2.1 No Action Alternative

Under the No Action Alternative, no further development activities on the northern portion of Wallops Island would occur beyond activities that are already occurring. Therefore, there would be no project related floodplain impacts.

3.5.4.2.2 Proposed Action: Phases 1, 2, and 3

Wallops Island is located entirely within the floodplain; therefore, all activities on land would take place within the 100-year floodplain and there are no practicable alternatives 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 1216.1 (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.

3.5.4.2.3 Alternative 1: Phase 1 Only

Under Alternative 1, potential floodplain impacts and compliance with EO 11988 would be the same as described for the Proposed Action.

3.5.4.2.4 Alternative 2: Phases 1 and 2 Only

Under Alternative 2, potential floodplain impacts and compliance with EO 11988 would be the same as described for the Proposed Action.

3.5.5 Coastal Zone

In accordance with the Coastal Zone Management Act of 1972 (16 U.S.C. § 1451, et seq., as amended) 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. Virginia's federally approved Coastal Zone Management (CZM) Program is administered by VDEQ. Although federal lands are excluded from Virginia's CZM Program, activities on federal land that have reasonably foreseeable coastal effects must be consistent to the maximum extent practicable with the enforceable policies of the CZM Program (VDEQ 2020).

3.5.5.1 *Affected Environment*

The Coastal Zone Management Act of 1972 (16 USC Part 1451, et seq., as amended) provides assistance to the states, in cooperation with federal and local agencies, for developing land and water use programs in coastal zones. Section 307(c)(1) of the Coastal Zone Management Act Reauthorization Amendment stipulates that federal projects that affect land uses, water uses, or coastal resources of a state's coastal zone must be consistent, to the maximum extent practicable, with the enforceable policies of that state's federally approved coastal zone management plan.

The Commonwealth of Virginia has developed and implemented a federally approved CZM Program. The Virginia CZM Program is administered by VDEQ and consists of a network of state agencies and local governments that regulate Virginia's coastal zone lands and resources. Virginia's CZM Program, which underwent a program change approved by NOAA on October 2, 2020, encompasses 12 enforceable policies for the coastal area pertaining to:

- Tidal and Non-Tidal Wetlands
- Subaqueous Lands
- Dunes and Beaches
- Chesapeake Bay Preservation Areas
- Marine Fisheries

- Wildlife and Inland Fisheries
- Plant Pests and Noxious Weeds
- Commonwealth Lands
- Point Source Air Pollution
- Point Source Water Pollution
- Nonpoint Source Water Pollution
- Shoreline Sanitation

3.5.5.2 *Environmental Consequences*

3.5.5.2.1 No Action Alternative

Under the No Action Alternative, no further development activities on the northern portion of Wallops Island would occur beyond activities that are already occurring. Therefore, there would be no project related coastal zone impacts.

3.5.5.2.2 Proposed Action: Phases 1, 2, and 3

NASA has determined that the Proposed Action would be consistent, to the maximum extent practicable, with the enforceable policies of Virginia's CZM Program. The Proposed Action's potential impacts on Virginia's coastal zone resources would be less than significant. A Federal Consistency Determination (FCD) analyzing the effects of the Proposed Action on Virginia's coastal zone resources will be submitted to VDEQ for review concurrently with the Draft EA public review period. A copy of the FCD is included in **Appendix C**. VDEQ provided a conditional concurrence with NASA's determination on February 28, 2022, pending additional coordination with the Virginia Department of Wildlife Resources (VDWR) and VMRC. Revised consultation was sent to VDWR and VMRC on March 2, 2023 to address previously provided comments and recommendations. VDWR responded on March 23, 2023, providing concurrence with NASA's revisions. VMRC responded on March 20, 2023, noting that while NASA's revisions are acceptable, final concurrence is dependent on VRMC permit review. NASA and MARS would coordinate with VMRC through the JPA process; this process would be initiated prior to any in-water activity or activity that may impact wetlands. A copy of this correspondence is included in **Appendix C**.

3.5.5.2.3 Alternative 1: Phase 1 Only

Activities that would be implemented under Alternative 1 are a subset of activities that would be implemented under the Proposed Action. Therefore, they would be consistent to the maximum extent practicable with the Virginia CZM Program and are addressed in the FCD included in **Appendix C**.

3.5.5.2.4 Alternative 2: Phases 1 and 2 Only

Activities that would be implemented under Alternative 2 are a subset of activities that would be implemented under the Proposed Action. Therefore, they would be consistent to the maximum extent practicable with the Virginia CZM Program and are addressed in the FCD included in **Appendix C**.

3.5.6 Sea-Level Rise

Several factors affect sea level, including changes in sea temperature, salinity, and total global water volume and mass. Coastal environments are highly dynamic and particularly vulnerable to climate change and rising sea levels. Sea-level rise is occurring along the Atlantic Ocean coastal zone. A June 2012, report from the U.S. Geological Survey states that since about 1990, sea-level rise in the stretch of Coastal Zone from Cape Hatteras, North Carolina to north of Boston, Massachusetts, has increased 2 to 3 millimeters (0.08 to 0.12 in) per year (USGS 2012).

3.5.6.1 *Affected Environment*

Wallops Island has experienced shoreline changes throughout the six decades that NASA has occupied the area. Scientists from NASA's Goddard Institute for Space Studies (GISS) used local data to refine global climate model outputs, making the projections WFF-specific, as described in Section 3.5.1.9 of the *Final Site-wide PEIS*. Outputs of the GISS models project rising average sea levels for the Wallops area over the next 80 years. NOAA publishes sea-level trend data at various tide locations along the coast (NOAA 2021). The nearest station with sea-level trend data is in Wachapreague, VA, which is approximately 32 km (20 mi) south of the proposed MARS Port location. The linear trend of the sea-level rise data since 1978 at this station indicates an average of 5.48 millimeters per year rise, or an estimated 0.55 m (1.8 ft) rise in 100 years. Alternatively, the USACE applied data from three coastal locations (Maryland, Delaware, and Virginia) to project sea-level rise over a 50-year period at Wallops Island between 2010 and 2060. The results showed a range from 0.17 to 0.69 m (0.56 to 2.25 ft) for the analysis period (USACE 2010).

NASA incorporates sea-level rise into planning and project designs, particularly for any facilities at Wallops Island as part of their SRIPP. Any permanent new construction that could be damaged and that is less than 3.4 m (11 ft) above MSL must be hardened or raised to avoid flooding from storm surge (NASA 2010b).

3.5.6.2 *Environmental Consequences*

3.5.6.2.1 No Action Alternative

Implementation of the No Action Alterative would not result in any direct, indirect, or cumulative effects related to sea-level rise from what is currently occurring or reasonably expected to occur in the future. No additional development beyond presently ongoing activities would occur in the northern Wallops Island coastal area that would be subject to sea-level rise. It is expected that the north Wallops Island beach would continue to grow, and the remaining areas to the south would continue to erode at historical rates exacerbated by the frequency and intensity of future storm events unless the shoreline infrastructure protection area continues to be maintained.

3.5.6.2.2 Proposed Action: Phases 1, 2, and 3

The scale of the activities under the Proposed Action are small relative to other human and naturally occurring activities that influence sea-level rise and, therefore, would have no foreseeable potential to contribute to sea-level rise. Depending on the extent of future sea-level rise at the northern end of Wallops Island, any new facilities could need to be elevated further or eventually replaced with structures that extend higher above the saltmarsh ground surface. As noted in the Section 3.5 of the *Final Site-wide PEIS*, NASA is implementing an adaptive management strategy regarding sea-level rise and its effects on project infrastructure. This adaptive management strategy was started in 2010 as part of the WFF SRIPP (NASA 2010b). Throughout the 50-year term of the SRIPP, the beach profile in front of the present shoreline would be renourished with sand every three to seven years to account for sea-level rise impacts to the Wallops Island shoreline (USACE 2010). As part of the adaptive management strategy, modifications are made as needed to ensure the viability of this long-term program meant to reduce the potential for damage to, or loss of, NASA, U.S. Navy, and MARS assets on Wallops Island from storm-induced wave action and sea-level rise impacts.

NOAA estimates that in 100 years, the mean higher high tide level will be +0.9 m (+3 ft) (NAVD88), which would put the pile caps for the new pier partially in the tidal zone. However, there would still be approximately 0.9 m (3 ft) of pier freeboard at high tide. The preliminary pier design would put the deck elevation at approximately 1.8 m (6 ft) for operational purposes. This elevation is below the Base Flood Elevation (approximately 2.7 m [9 ft]) but would keep the pier superstructure out of the splash zone of the mean higher high water level (including the addition of predicted sea-level rise) as much as possible from a durability and resiliency standpoint. Permanent above-ground electrical infrastructure associated with the proposed onshore facilities at the MARS Port (e.g., second hanger) would be at a minimum elevation of 3.4 m (11 ft) to provide protection from storm surge flooding and potential sea-level rise.

3.5.6.2.3 Alternative 1: Phase 1 Only

Potential impacts of sea-level rise under Alternative 1 would be the same as described for the Proposed Action.

3.5.6.2.4 Alternative 2: Phases 1 and 2 Only

Potential impacts of sea-level rise under Alternative 2 would be the same as described for the Proposed Action.

3.6 Vegetation

This section discusses common native and non-native plant communities in the Project Area. Vegetation species with a federal or state listing status due to their rarity are discussed in greater detail in Section 3.9.

3.6.1 Affected Environment

Vegetation on the north end of Wallops Island consists of maritime forest, maritime grasslands, non-tidal wetlands (emergent and scrub-shrub), and tidal wetlands. The dominant habitat within the Project Area is tidal marsh, which transitions to upland grass and maritime forest areas to the east and south of the UAS Airstrip and to the north and west into open surface water of the Chincoteague Inlet. Low tidal marsh is present along the northern portion of the Project Area in the vicinity of the proposed pier. Representative species of common native vegetation known or potentially occurring in the Project Area are listed in **Table 3.6-1**.

Within the Project Area, native vegetation was temporarily disturbed and permanently removed during construction of the UAS Airstrip, which was completed in 2017. Temporarily disturbed areas adjacent to the UAS Airstrip were replanted with native species in accordance with NASA WFF vegetation management policies. Vegetated areas adjacent to the UAS Airstrip are periodically mowed to maintain an obstruction-free zone to facilitate the safe operation of aircraft using the runway (NASA 2020a).

Vegetation in the surrounding marshes primarily consists of a high and low tidal marsh community, typified by the marsh species shown in **Table 3.6-1**. The high marsh and low marsh zones are dominated by saltmeadow hay and saltmarsh cordgrass, respectively.

The nearest submerged aquatic vegetation is 4.8 km (3 mi) north of the project and would have no potential to be affected by the Proposed Action; therefore, is not discussed in further detail (VIMS 2019).

The maritime dune woodland is a rare, upland, vegetation community that exists in the Project Area at and adjacent to the location of the proposed second hangar. Approximately 0.90 ha (2.2 ac) of maritime dune woodland occur in the Project Area. The maritime dune woodlands community type has a natural heritage status ranking of globally critically imperiled (G1) and state critically imperiled (S1), but is not considered a legally protected natural community. These communities are composed of deciduous, maritime shrubland or scrub forest on the mid-Atlantic coast that can also include coniferous and broadleaf evergreens. Physiognomy can vary dramatically ranging from open woodlands to stunted forests to dense thickets occurring on the lee side of sand dunes. This community occurs within a narrow geographic range, with the northern extent being southern New Jersey and the southern extent being Virginia. Occurrences are naturally small, usually a few acres, and confined to the oceanward portion of barrier islands (VDCR 2021).

Table 3.6 1. Vegetation Species with Potential to Occur in the Project Area			
Common Name	**Scientific Name**	**Habitat Type**	**Description**
Upland			
Crabgrass	*Digitaria sanguinalis*	Grassy upland areas	These species commonly occur in areas of NASA WFF that are primarily maintained by mowing.
Bermuda grass	*Cynodon dactylon*		
Meadow fescue	*Schedonorus pratensis*		
Bluegrass	*Poa* spp.		
Sheep sorrel	*Rumex acetosella*		
Chickweeds	*Cerastium* spp.		
Black cherry	*Prunus serotina*	Forest	These species occur in the uplands surrounding the airfield but outside of the mowed, grassy, upland areas.
Loblolly pine	*Pinus taeda*		
Eastern red cedar	*Juniperus virginiana*		
Greenbriar	*Smilax* spp.		
Tidal Marsh			
Saltmarsh cordgrass	*Spartina alterniflora*	High and Low Tidal Marsh	These species commonly occur in the marshes surrounding the UAS Airstrip.
Saltmeadow hay	*Spartina patens*		
Saltgrass	*Distichlis spicata*		
Saltwort	*Salsola* spp.		
Sea lavender	*Limonium* spp.		
Common reed	*Phragmites australis*		
Beaches and Dunes			
American searocket	*Cakile edentula*	Beaches	These species occur on beaches and dunes of North Wallops Island.
Seabeach orach	*Atriplex arenaria*		
American beachgrass	*Ammophila breviligulata*	Dunes	
Saltmeadow cordgrass	*Spartina patens*		
Beach panic grass	*Panicum amarum*		
Seaside goldenrod	*Solidago sempervirens*		

Sources: NASA 2019a, NASA 2020a

A rare, herbaceous plant that has been recorded in the Project Area is seaside thoroughwort (*Eupatorium maritimum*). *E. maritimum* is ranked as globally imperiled (G2) and state critically imperiled (S1), but is not considered a legally protected species. Habitat for *E. maritimum* consists of interdunal swales in Virginia and the Outer Banks region of North Carolina (NatureServe 2020). A population of *E. maritimum* was found along an old access road when the area was last surveyed in 2011. The linear habitat in which the population occurred was within the area affected by the construction of the UAS Airstrip in 2012 (VDCR 2012). That area is now within the stormwater infiltration trench adjacent to the airstrip in an area that is kept mowed. The new hangar to be constructed as part of the Proposed Action is the only structure that would be located close to the previously described *E. maritimum* location. However, due to the construction and ongoing maintenance of the UAS Airstrip, *E. maritimum* is considered unlikely to be currently present in the Project Area.

Sand material from dredging the turning basins and channels during project construction and long-term maintenance would be placed on Wallops Island beaches in conjunction with the ongoing restoration activities of the SERP. Beach habitat on Wallops Island consists of upper beaches and overwash flats, which are areas above the high tide line that are occasionally flooded by storm surges and high spring tides. These beach areas have only sparse vegetation, which includes American searocket and seabeach orach. Maritime grasslands occur on the foredunes and secondary dunes. Vegetation in these areas includes American beachgrass, saltmeadow cordgrass, beach panic grass, and seaside goldenrod. (NASA 2019a)

In 2007 and 2008, a combination of field surveys and aerial photograph interpretation were employed to estimate the real extent of invasive species infestation at WFF. Of the approximately 320 ha (790 ac) of invasive species identified, *Phragmites australis* (*Phragmites*) accounted for 88 percent of the acreage with a total of 278 ha (687 ac) on Wallops Island, 0.4 ha (1 ac) on the Mainland, and 4.5 ha (11 ac) at the Main Base (NASA 2008). A Natural Heritage Survey of North Wallops Island conducted in the summer and fall of 2011 by the Natural Heritage Division of the Virginia Department of Conservation and Recreation (VDCR) came to a similar conclusion, noting that large portions of the study area were dominated by *Phragmites* (VDCR 2012). According to Warren et al. (2001), *Phragmites* has been a minor component of Mid-Atlantic brackish tidal wetlands for over 3,000 years. However, due to the introduction of new genotypes, which are invasive, and human disturbance of coastal areas, *Phragmites* has recently become a problematic invasive species with expansion rates of 1 to 3 percent per year. The invasive genotype of *Phragmites* is a tall (5 m [15 ft]), perennial grass with creeping rhizomes that may make a dense vegetative mat. Thick rhizomal growth and the accumulation of litter from the aerial shoots, prevent other species from becoming established. *Phragmites* is an opportunistic species, taking advantage of the disturbances to the local vegetative community caused by disruptions of the natural state, such as those caused by fire or earth-moving activities.

3.6.2 Environmental Consequences

Impacts on vegetation would be considered significant if species or habitats would be substantially affected over relatively large areas, habitat disturbances would result in reductions in the population size or distribution of a species, or invasive species (e.g., *Phragmites australis*) would be introduced to sensitive habitats. Potential impacts on vegetation in the Project Area are discussed in Sections 3.6.2.1 through 3.6.2.4.

3.6.2.1 *No Action Alternative*

Under the No Action Alternative, the MARS Port and associated infrastructure described in Section 2.7 would not be constructed or operated, and current conditions on Wallops Island would continue. The port, operations area, and intermodal facility would not become part of the M-95 Marine Highway Corridor. NASA WFF and VCSFA would continue to use existing facilities and available transportation routes to support their respective missions. Vegetation on Wallops Island would continue to be managed in accordance with NASA WFF policies and procedures. This would have no effect on vegetation in the Project Area.

3.6.2.2 *Proposed Action: Phases 1, 2, and 3*

Minor short-term impacts on upland vegetation would occur in the area surrounding the UAS Airstrip because of vegetation clearing and during repair from ground disturbances associated with equipment and workers accessing and working in the area adjacent to the airstrip and parking lot. These areas have been previously disturbed, are maintained by mowing, and consist of low-growing vegetation. No noteworthy vegetation species are present in these areas, and the removal of mature trees would be minimized to the extent possible and limited to those necessary to complete the proposed facilities. Generally, effects on any species would occur at the individual rather than community, population, or species level and would not prevent or delay the continued propagation of any species.

After the Project is completed (Phase 1 beginning in 2023 and being completed by 2026, with approximately 1 to 2 years between subsequent phases), temporarily disturbed areas that would not be developed or otherwise built on would be replanted with native vegetation in accordance with NASA WFF vegetation management policies or maintained in a permeable condition. The distribution of the project activities over a multi-year period would minimize the intensity of impacts by ensuring that short-term impacts on vegetation do not occur simultaneously. Therefore, short-term adverse impacts on vegetation from the Proposed Action would be minor.

In the long term, construction of the proposed facilities would permanently remove approximately 1.0 ha (2.5 ac) of vegetation in the Project Area, primarily in upland areas adjacent to and near the UAS Airstrip. Estimated permanent vegetation impacts from the Proposed Action are summarized in **Table 3.6-2**. The proposed construction activities are shown on **Figure 1-2.**

Table 3.6 2. Estimated Permanent Upland Vegetation Impacts from the Proposed Action

Construction Action	Area	Upland Vegetation Impact Area (ha / ac)[1]	Notes
Parking lot construction	Northwest intersection of the UAS Airstrip access road and runway	0.2 / 0.5	Would result in the permanent loss of primarily upland forest (0.2 ha [0.5 ac]).
Project support building construction	Southwest end of the UAS Airstrip access road	0.4 / 1.0	Would result in the permanent loss of upland vegetation (mowed grass) in the Project Area.
Hangar 2 construction	East of the existing UAS Airstrip hangar	0.2 / 0.6	Would result in the permanent loss of maritime dune woodland in the Project Area.
Total estimated area of vegetation permanently removed		0.8 / 2.1	

[1] Areas shown include a 9 m (30 ft) buffer around each structure.
Note: Impacts to wetland vegetation are discussed in Section 3.5.3.2

In the context of existing, common vegetation communities in and around the Project Area, the loss of approximately 0.8 ha (2.1 ac) of upland (non-wetland) vegetation would be small. Extensive vegetation would remain around the airstrip and in other areas of NASA WFF as well as nearby NWRs maintained by USFWS. However, a rare vegetation community in the Project Area, maritime dune woodland, would be impacted by the permanent removal of approximately 0.24 ha (0.59 ac) of woodland adjacent to the airfield for the proposed construction of Hangar 2. The maritime dune woodland community on the north end of Wallops Island currently covers approximately 0.90 ha (2.2 ac). Clearing for the hangar would reduce the extent of this local community by approximately 27 percent. The population of the herb *Eupatorium maritimum* that was identified on the maintained runway shoulder in 2011 would not be impacted since it is located outside the footprint of the proposed construction for Hangar 2. NASA and VCSFA, however, would conduct vegetation surveys prior to construction and would avoid any identified areas to the maximum extent practicable (**Table 4-1**).

Areas not built on or otherwise developed would be replanted with native species in accordance with NASA WFF vegetation management policies or returned to a permeable condition (see Section 4.2). Vegetation impacts would be distributed over the Proposed Action's multi-year implementation period, further minimizing impacts because not all vegetation would be cleared simultaneously by the Project. For these reasons, long-term impacts from the Proposed Action on common species of upland vegetation would be minor. The removal of maritime dune woodland, although small in area, would represent a notable reduction in the extent of this local community and vegetative diversity on Wallops Island. The potential for replanting suitable, nearby areas with vegetation from this community as mitigation would be investigated.

Impacts to wetland vegetation are discussed in Section 3.5.4.2. The area of tidal marsh vegetation that would be permanently impacted by the Proposed Action would total approximately 0.24 ha (0.6 ac).

Wetland areas that are disturbed may become more susceptible to colonization by invasive species, especially *Phragmites*. Upland areas disturbed during construction would be subject to the potential for *Phragmites* invasion due to the disturbance. Project-specific *Phragmites* management and control measures would be implemented to minimize the potential for the spread of these species including:

- Mowing of small infestations, and
- Requiring special considerations for operating heavy equipment in *Phragmite*s-infested areas (e.g., restricting construction equipment from areas prone to invasion, cleaning of construction equipment of all visible dirt and plant debris prior to leaving the construction site, and post-construction monitoring and mowing) (see Section 4.2).

As described in Section 2.3.2, the option selected for the placement of dredged material from construction dredging and long-term maintenance dredging is the pumping of the material from transport barges onto the beach in the SERP area. The elements of the ongoing project to protect Wallops Island shoreline infrastructure through beach renourishment are described in detail in the *SERP EA* (NASA 2019c). The dredged material placement activities of the Proposed Action would be coordinated with and incorporated into the ongoing SERP activities. Effects from the placement of sand material on the beaches and associated impacts on beach vegetation were evaluated in the *Final SRIPP Programmatic Environmental Impact Statement* (PEIS; NASA 2010b). The *Final SRIPP PEIS* evaluated the potential effects on beach vegetation associated with the range of SRIPP activities on Wallops Island beaches, including placement of the material on the beaches being restored. The *Final SRIPP PEIS* concluded that during beach renourishment there would be some temporary impacts on beach vegetation. Equipment used during sand placement activities would likely crush or disturb some vegetation in the upper beach zone. However, the addition of sand would result in long-term beneficial impacts on existing vegetation. Beach and dune habitat would be expanded and restored, dunes would be planted with American beach grass, and other native vegetation would likely repopulate the upper dune areas. (NASA 2010b) Therefore, potential effects on vegetation from the placement of dredged material in conjunction with restoration of the beaches would be mainly beneficial.

Overall, short-term adverse impacts on vegetation from the Proposed Action would be minor to moderate, as would long-term beneficial impacts.

3.6.2.3 *Alternative 1: Phase 1 Only*

Impacts on vegetation in the Project Area from Alternative 1 would be the same as those described for the Proposed Action. Therefore, short-term and long-term impacts on vegetation from Alternative 1 would be minor to moderate.

3.6.2.4 *Alternative 2: Phases 1 and 2 Only*

Impacts on vegetation in the Project Area from Alternative 2 would be the same as those described for the Proposed Action and Alternative 1. Therefore, short-term and long-term impacts on vegetation from Alternative 2 would be minor to moderate.

3.7 Wildlife

This section discusses common wildlife species known or suspected to occur in and around the Project Area. Special-status species, including federal and state listed threatened and endangered species, marine mammals, and bald eagles, are discussed in Section 3.9.

3.7.1 Affected Environment

Wildlife in the Project Area includes terrestrial species, which occur and reproduce mainly on land, and aquatic species, which occur and reproduce mainly in the estuarine waters surrounding the north end of Wallops Island. Representative species of common terrestrial wildlife that are known or suspected to occur in and around the Project Area are discussed in Section 3.7.1.1, and common aquatic species likely to occur in the Project Area are discussed in Section 3.7.1.2.

3.7.1.1 *Terrestrial Species*

Common species of terrestrial wildlife known or expected to occur in and around the Project Area are listed in **Table 3.7-1** and discussed in the following corresponding sub-sections.

Mammals

The white-tailed deer is the only large mammal that occurs at WFF. The terrestrial mammals listed in **Table 3.7-1** may use upland areas in and around the Project Area for nesting or denning, breeding, and foraging (NASA 2017). Semi-aquatic mammals such as the river otter and muskrat may inhabit the marshes and streams in the Project Area.

Birds

Consistent with its coastal setting, birds are abundant in and around the Project Area. Much of WFF is located within the Audubon-designated Barrier Island Lagoon System Important Bird Area and along the Atlantic Flyway, a migratory corridor for land and water birds along the East Coast of the U.S. (NASA 2019a). The area has also been designated as a United Nations Educational, Scientific, and Cultural Organization Biosphere Reserve and a Western Hemisphere Shorebird Reserve Site (NASA 2019a). Barrier islands such as Wallops Island provide particularly important habitat for migratory birds. Some migratory species use the island as a stopover point, while others overwinter or breed there. The highest concentrations of migratory birds tend to occur on the bay side (west side) of Wallops Island (NASA 2019a) and in the marsh habitats surrounding WFF.

The Wallops Island beach provides important nesting and foraging habitat for a number of migratory waterbirds, including gulls, terns, and sandpipers. Waterbird numbers on the beach peak during the fall and spring migrations, during which the beach provides stopover habitat for resting and feeding as the birds transit between breeding and wintering grounds. Important food sources include fish, mollusks, insects, worms, and crustaceans (NASA 2019c).

At least 150 bird species are known or have potential to occur in or near the Project Area. Common species include a variety of songbirds, raptors, waterfowl, shorebirds, and wading birds. Raptors occur mainly in the marsh areas west of Wallops Island and waterfowl species frequently overwinter in areas around the Project Area (NASA 2019a). The VDWR Wildlife Environmental Review Service depicts the Coastal Avian Protection Zone across the entire Project Area (WERMS 2020).

Most bird species in the proposed Project Area are protected by the Migratory Bird Treaty Act (MBTA), and a subset of these are considered Birds of Conservation Concern (BCC). Federally and state-listed bird species and birds protected under the MBTA are discussed in Section 3.9.

Table 3.7 1. Terrestrial Wildlife Species with Potential to Occur in the Project Area

Common Name	Scientific Name	Habitat Type	Notes
Mammals			
White-tailed deer	*Odocoileus virginianus*	Various upland habitats, grassland to forest	The only large mammal that occurs at WFF.
Red fox	*Vulpes vulpes*	Various upland habitats, grassland to forest	May use a variety of upland habitats on WFF.
Raccoon	*Procyon lotor*	Wetlands and forested areas	
River otter	*Lontra canadensis*	Tidal marsh, other wetlands and water bodies	Semi-aquatic; may inhabit estuaries as well as fresh water.
Birds			
Great horned owl	*Bubo virginianus*	Coastal forest	Have been observed in maritime forest at WFF.
Willet	*Tringa semipalmata*	Marshes, beaches	Very common at WFF during breeding season.
Laughing gull	*Leucophaeus atricilla*	Salt marsh, beaches	Common at WFF.
American oystercatcher	*Haematopus palliates*	Beaches, tidal flats	Occurs on Wallops Island year-round
Marsh wren	*Cistothorus palustris*	Salt marshes and other wetlands	Potentially occurs at WFF year-round.
American black duck	*Anas rubripes*	Salt marshes, bays, estuaries	Commonly overwinters at WFF.
Canada goose	*Branta canadensis*	Salt marshes, bays, ponds, fields	Common at WFF throughout the year.
Herring gull	*Larus argentatus*	Salt marshes, bays, beaches	Occurs at WFF throughout the year.
Osprey	*Pandion haliaetus*	Salt marshes, estuaries, shoreline	Commonly occurs at WFF in breeding season.
Snowy egret	*Egretta thula*	Salt marshes and other wetlands, bays	Occurs at WFF mainly in breeding season.
Reptiles and Amphibians			
Fowler's toad	*Anaxyrus fowleri*	Sand dunes, sandy woodlands, dry scrub	Adult habitat and breeding pools present in north Wallops Island.
Eastern rat snake	*Pantherophis alleghaniensis*	Various, especially forested	In north Wallops Island, most likely in forested areas.
Eastern box turtle	*Terrapene carolina*	Wooded areas	In north Wallops Island, most likely in forested areas.
Northern diamondback terrapin	*Malaclemys terrapin*	Brackish wetlands	Most likely in marshes on west side and north end of Wallops Island
Invertebrates			
Salt marsh grasshopper	*Orchelium fidicinium*	Salt marsh	Diversity of insects at WFF is highest in marsh and other wetland areas.
Planthoppers	*Prokelisia* spp.	Saltmarsh and others	
Salt marsh mosquitoes	*Ochlerotatus* spp.	Salt marsh	
Greenhead flies	*Tabanus nigrovittatus*	Salt marsh	

Source: NASA 2017

Reptiles and Amphibians

Reptiles and amphibians occurring in the terrestrial habitats in the Project Area include a variety of toads, snakes, lizards, and turtles that inhabit salt marsh or adjacent upland habitats. Common terrestrial reptiles and amphibians at WFF may inhabit freshwater depressions, scrub-shrub habitat, or saltmarsh (NASA 2017).

Invertebrates

Invertebrates occur in all terrestrial habitat types in the Project Area. However, their diversity is highest in marsh and wetland areas. Common insects occurring at WFF include various grasshoppers, mosquitoes, flies, and wasps. Spiders and mites are also common (NASA 2017).

3.7.1.2 *Aquatic Species*

Common aquatic species known or expected to occur in and around the Project Area are predominantly fish and invertebrates, which are discussed below. Less common aquatic species with special protected status and the potential to occur in the Project Area, including marine mammals, sea turtles, and certain fish, are further discussed in Section 3.9.

Fish

Several common species of marine and estuarine fish found in the waters near Wallops Island and potentially in the Project Area are shown in **Table 3.7-2.** During the summer months, variations in salinity and water depth are influencing factors on the presence of coastal fish species in the bays and inlets around WFF (Ellis 2003). The tidal marsh areas near Wallops Island provide nursery habitat for a variety of fish species due to the protection the marsh grasses provide and the abundance of food. Several fish species, such as bluefish, spot, and summer flounder, are popular game fish for recreational and commercial fishermen. Fisheries in and near the Project Area are discussed in Section 3.8.

Table 3.7 2. Common Fish Species Likely to Occur in the Project Area

Common Name	Scientific Name	Habitat Type	Notes
Fish			
Atlantic croaker	*Micropogonias undulates*	Marine	Common fish species found in the waters near Wallops Island.
Sand shark	*Carcharias aurus*	Marine	
Smooth dogfish	*Mustelus canis*	Marine	
Smooth butterfly ray	*Gymnura micrura*	Marine	
Bluefish	*Pomatomidae saltatrix*	Marine	
Spot	*Leiostomus xanthurus*	Marine, marsh grasses	
Summer flounder	*Paralichthys dentatus*	Marine	
Northern pipefish	*Syngnathus fuscus*	Marine, marsh grasses	
Dusky pipefish	*Syngnathus floridae*	Marine, marsh grasses	
Bay anchovy	*Anchoa mitchilli*	Marine, marsh grasses	

Sources: NASA 2017, Ellis 2003

Invertebrates

Most major invertebrate groups are found in the nearshore, sandy environment around the proposed Project Area, including mollusks (e.g., clams and whelks), crustaceans (e.g., crabs, shrimp, and amphipods), and polychaetes (i.e., marine worms). Other species of decapod crustaceans, stomatopod crustaceans, and cephalopods also occur in the nearshore areas (USN 2014). The abundance of many of these species varies seasonally.

A benthic macroinvertebrate survey was performed in July 2020 to characterize the existing community in a portion of the Project Area at the north end of Wallops Island (AECOM 2021). Sediment samples were collected at six locations along an east-west transect through the area where the proposed pier would be constructed. These locations were representative of the area that includes the pier and the areas proposed to be dredged for the turning basins and western end of the approach channel. The benthic samples were collected from subtidal areas at locations ranging from approximately 40 to 285 m (130 to 930 ft) offshore of the tidal marsh.

The majority of organisms in the benthic samples (55 percent of identified individuals) were annelid worms (Class Polychaeta), which are deposit feeders that either sit with their anterior ends at the surface or make shallow head-down burrows into the sediment. Polychaetes are highly opportunistic and have the ability to rapidly recolonize disturbed areas (AECOM 2021). The next most abundant taxa were bivalve molluscs (26 percent of identified individuals), followed by amphipods. These organisms live in and on the bottom sediment, where they consume bacteria and detritus in the sediment and can be prey for higher-trophic-level predators. The overall abundance and diversity of these organisms were low, which is typical for estuarine and anthropogenically disturbed environments. The majority of the polychaetes identified were small and threadlike species from the families Capitellidae and Spionidae, and although they composed approximately 40 percent of the individual organisms counted, they made up only a small percentage of the overall biomass in the samples. Therefore, they are unlikely to be a substantial component of the diet of bottom-feeding fish (AECOM 2021).

More than one-third (39 percent) of the identified organisms from the six samples consisted of two opportunistic polychaete taxa that are well documented as being typically found in areas of anthropogenic disturbance, have high tolerance to dredging and disposal, are some of the first species to recolonize areas following anoxic events, and are able to repopulate habitats that experience extreme fluctuations in conditions (AECOM 2021). The six samples collected had hydrogen sulfide odor that suggested the sediments were either anoxic or hypoxic at the time they were sampled. Hypoxia is not uncommon in intertidal and shallow subtidal estuaries along the eastern U.S. coastline due to high levels of organic content in the sediment because of excess nitrogen from decaying salt marsh peat material and possibly anthropogenic sources. The benthic infaunal community of the Project Area was low in abundance of organisms and diversity of taxa. The community was dominated by opportunistic species that can rapidly recolonize disturbed habitat from surrounding habitats (AECOM 2021).

The VMRC promotes and regulates clam and oyster farming and gardening, also known as shellfish aquaculture, in the subaqueous lands of Virginia. VMRC issues oyster ground leases to individuals who wish to conduct aquaculture in approved areas and issues permits and licenses depending on location, aquaculture method, and whether the shellfish will be sold commercially (VMRC 2019).

In addition to issuing private aquaculture leases, Virginia committed to maintain public access to the natural oyster beds identified in the 1890s by James Baylor of the U.S. Coast and Geodetic Survey. These public areas are designated by VMRC as Baylor grounds and are mandated to be "… held in trust for the benefit of the people of the Commonwealth."

Waters near the Project Area contain public and private shellfish harvesting areas (VRMC 2019), the closest of which are the following:

- Private oyster grounds in Ballast Narrows and Chincoteague Channel
- Public clamming grounds along the west side of Walker Marsh, north of Wallops Island.

Sand material from the dredging of turning basins and channels during project construction and long-term maintenance would be placed on Wallops Island beaches in conjunction with the ongoing restoration activities of the SERP. Beach habitat on Wallops Island consists of upper beaches and overwash flats, which are areas above the high tide line that are occasionally flooded by storm surges and high spring tides. Air-breathing crustaceans, such as ghost crabs (*Ocypode quadrata*), dominate the uppermost zone of the Wallops Island beach, while the swash zone is dominated by isopods, amphipods, polychaetes, and mole crabs (*Emerita talpoida*). Below the mid-tide line is the surf zone, where coquina clams (*Donax variabilis*) and a variety of amphipods are prevalent. All such organisms are important prey species for a variety of waterbirds and fish (NASA 2019c).

3.7.2 Environmental Consequences

Determination of the significance of potential impacts on common terrestrial wildlife and aquatic species is based on the sensitivity of the species to the proposed activities and the amount of habitat that would be temporarily or permanently impacted. Impacts on terrestrial wildlife would be considered significant if a species would be substantially affected over relatively large areas or if disturbances resulted in reductions in the population size or distribution of one or more species. Potential impacts on terrestrial wildlife and aquatic species are discussed for the project alternatives in Sections 3.7.2.1 through 3.7.2.4.

3.7.2.1 *No Action Alternative*

Under the No Action Alternative, the MARS Port and associated infrastructure described in Section 2.7 would not be constructed or operated, and current conditions on Wallops Island would continue. The port, operations area, and intermodal facility would not become part of the M-95 Marine Highway Corridor. NASA WFF and VCSFA would continue to use existing facilities and available transportation routes to support their respective missions. This would have no effect on wildlife in the Project Area.

3.7.2.2 *Proposed Action: Phases 1, 2, and 3*

Terrestrial Wildlife

The Proposed Action would have minor, short-term impacts on terrestrial wildlife resulting from the removal of habitat as well as disturbance and displacement by construction activities, including associated noise, light, and increased human activity. Mobile or faster-moving species, such as most mammals and birds, would relocate to areas offering similar habitat in or near the Project Area that would remain undisturbed by project activities. Slower-moving or less-mobile species may be inadvertently injured or destroyed by construction equipment and vehicles, resulting in an adverse impact. However, the number of individuals injured or destroyed during construction activities would be anticipated to remain small.

While adverse, short-term impacts on wildlife from construction activities associated with the Proposed Action would occur at the individual level and would not prevent or delay the continued propagation of common wildlife species and populations in and around the Project Area. The intensity and duration of construction activity and disturbed areas would vary throughout the Proposed Action's construction phases, resulting in corresponding variations in the intensity and duration of short-term impacts. Following the cessation of construction activities disturbing to wildlife, it is expected that many species would return to the remaining habitats in and around the Project Area. The phased implementation of the Proposed Action would distribute potential impacts on wildlife over multiple years, thereby minimizing impacts by ensuring that not all impacts occur simultaneously.

In the long term, increased vehicle traffic and human activity associated with the proposed MARS Port would have the potential to indirectly disturb wildlife in nearby areas. It is anticipated that species that are sensitive to such activity would avoid the MARS Port area and seek suitable habitat in nearby, less-disturbed environments, while species that are conditioned to a higher degree of human activity or urbanized environments would continue to inhabit the area. The Proposed Action would not involve the long-term, continued disturbance of terrestrial wildlife in and around the Project Area. Generally, common wildlife species displaced by the proposed facilities would relocate to other areas in and around the Project Area offering similar habitat conditions. The proposed facilities would be constructed and operated in accordance with NASA WFF design criteria, including the incorporation of downward pointing and/or low-glare lighting, to minimize any long-term effects on wildlife (see Section 4.2). Thus, long-term impacts on terrestrial wildlife from the construction and operation of the Proposed Action would be minor.

As described in Section 2.3.2, the option selected for the placement of dredged material from construction dredging and long-term maintenance dredging under the Proposed Action is the pumping of the material from transport barges onto the beach in the SERP area. The elements of the ongoing project to protect Wallops Island shoreline infrastructure through beach renourishment are described in detail in the *SERP EA* (NASA 2019c). The dredged material placement activities of the Proposed Action would be coordinated with and incorporated into the ongoing SERP activities. Effects from the placement of sand material on the beaches and associated impacts on wildlife, principally birds, that occur within beach habitats were evaluated in the *SERP EA*.

Temporary noise and visual disturbances from construction equipment and personnel could adversely affect beach foraging and nesting by birds. Direct effects could include eliciting a startle or flee response, which for foraging birds could temporarily interrupt feeding activities or cause individuals to relocate to other areas of the beach. If nesting birds were to flush from nests, it could lead to an elevated risk of egg overheating or predation. It would also be possible for equipment to inadvertently crush or bury nests or chicks if the nests were undetected. Adverse effects would also occur from a reduction in available food sources during and following the placement of sand on the Wallops Island shoreline. Potential impacts to wildlife would be reduced by the avoidance measures employed for special-status species (i.e., daily monitoring and 305 m [1,000 ft] nest buffer enforcement) at the north Wallops Island borrow area during piping plover and loggerhead sea turtle nesting season) (NASA 2019c).

It is unknown to what extent the newly created Wallops Island beach in the shoreline infrastructure protection area would be used by shorebirds. The actual usage patterns would substantially affect potential impacts. Effects on prey availability are expected to be a contributing factor, and given that the newly placed beach is likely in a biologically suppressed state, it is possible that bird species would congregate closer to more forage-rich areas outside of the affected area. It is expected that invertebrates from adjacent areas would recolonize the new beach in a relatively short time (i.e., on the order of 6 to 12 months after renourishment), and available forage would most likely recover within 1 year. Long term, the renourished beach could create suitable shorebird nesting habitat of benefit to all beach-nesting species (NASA 2019c). The placement of dredged material on beaches in conjunction with the SERP was found to have short-term adverse effects on birds; however, the effects from beach restoration over the long term would likely be mainly beneficial (NASA 2019c).

Aquatic Species

The Proposed Action would have minor short-term impacts on aquatic species resulting from construction of the pier/port, including in-water pile driving as well as initial dredging of the channel and turning basins and periodic maintenance dredging during long-term operation of the MARS Port. The predominant reaction from most species would likely be avoidance of the area due to the increase in human/vessel activity and noise from in-water construction, pile driving, dredging, and other associated activities. Less-mobile species (e.g., benthic organisms) could be inadvertently destroyed by pile driving and/or dredging. Impacts would occur at the individual rather than population or species level and would not prevent or delay the continued propagation of any species.

Fish

In the short term, construction of the proposed pier and associated increases in turbidity, noise, and vessel traffic would have the potential to disturb fish in the Project Area. In-water construction activities involving disturbance of the subaqueous bottom, such as pier construction (including pile driving), vessel and barge anchoring, and dredging of the turning basins and access channels, would also have the potential to inadvertently destroy or displace benthic invertebrates that provide a food source for fish. These activities would disturb sediments, which would temporarily increase turbidity, decrease visibility and light penetration, and interfere with respiration by fish and their invertebrate prey. The inadvertent smothering of prey species by increased turbidity and sedimentation would be localized and would not substantially affect the quantity of prey available in waters near the Project Area.

The UAS Airstrip access road would be widened on the west side only, with a matching diameter extension of the culvert spliced to the existing culvert. In order to maintain passage for fish and other aquatic organisms, if necessary, a larger culvert would be spliced and countersunk at least 15 cm (6 in) below the streambed. Therefore, no changes are anticipated to passage for aquatic organisms through the stream.

It is likely that individual animals, particularly highly mobile species such as fish, would be alerted to the increased human presence and vessel activity and would relocate to quieter or less-disturbed areas nearby that offer similar habitat. While this would be an adverse effect, avoidance of the Project Area by individuals during construction activities would not be anticipated to substantively affect behaviors such as migration, mating, or foraging for food. Eggs, larval stages, and sessile or sedentary species typically would be the most susceptible to entrainment by dredging (LaSalle et al. 1991). Entrainment rates tend to be low but are typically found to be more problematic in cutter/suction dredging, due to its continuous nature, than in clamshell bucket dredging. However, fish species that lay demersal eggs (those that are laid on the bottom or attached to substrate) in the dredging area may experience direct mortality of eggs during dredging operations if entrained. The inadvertent smothering of prey species by increased turbidity sedimentation would be localized and would not substantially affect the quantity of prey available in waters near the Project Area.

The locations and quantities of sediment disturbance would be distributed throughout the implementation period of the Proposed Action, and disturbed sediments would be expected to quickly resettle near their original location in the relatively shallow waters of the Project Area. As discussed in Section 3.5.1.2, the primary physical impact from mechanical dredging involves a re-suspension of sediments and increased turbidity that could adversely affect marine life and water quality. Proposed dredging operations would likely cause sediment to be suspended in the water column.

The sandy dredge material is anticipated to settle quickly; however, turbidity control measures, such as turbidity curtains (also referred to as sediment curtains), could be implemented if warranted to prevent suspended sediments from exceeding water quality standards. If the use of turbidity curtains is not possible due to current velocities, dredging would be conducted during slack tides (i.e., on the western portion of the channel during flood tide and the eastern portion of the channel during ebb tides.) Thus, the areas of estuarine habitat that would be affected by turbidity from the Proposed Action would be minimal in comparison to the extensive surrounding areas, and effects on fish and invertebrates would be of short duration.

Noise effects on fish can range from behavioral changes/disturbance to physical injury. The thresholds for effects vary among types of organisms. The potential effects of noise from the Proposed Action on special status aquatic organisms are evaluated in detail in Section 3.9.

The NOAA Fisheries Greater Atlantic Regional Fisheries Office (GARFO) developed a spreadsheet Acoustics Tool (NOAA Fisheries 2020a) for analyzing the effects of pile driving in inshore waters on species of the Greater Atlantic Region. GARFO developed a Simplified Attenuation Formula (SAF) for use in estimating the ensonification area of pile-driving projects in shallow, inshore environments, such as the bays and waterways of the Project Area. Based on the characteristics of the proposed pile driving, the noise levels at the source associated with pile driving for the Proposed Action were estimated and used in the GARFO model to estimate the distances from pile-driving activities at which thresholds for noise-related effects would be exceeded. Because sound (noise) consists of variations in pressure, the unit for measuring sound is referenced to a unit of pressure, the Pascal (Pa). A dB is defined as the ratio between the measured sound pressure level (SPL) in microPascals (μPa) and a reference pressure. In water, the reference level is decibels relative to 1 microPascal (dB re 1 μPa). SPL units can be expressed in several ways depending on the measurement properties. Acoustic source levels and SELs also are expressed in decibels.

The evaluation of potential effects on fish from pile-driving noise used the model to estimate distances from the pile-driving location at which fish injury and effects thresholds may be exceeded. The results indicate that exposure to an SPL_{peak} that may result in injury to fish is not anticipated to occur during pile driving for the Proposed Action because the SPL_{peak} at the source (185 dB re 1 Pa) would be less than the effects threshold (206 dB re 1 Pa). However, based on the SEL_{cum} exposure criterion (187 dB re 1 Pa), injury to a sturgeon or other fish potentially could occur if the fish remained within 30 m (98 ft) while the pile was being driven. This is extremely unlikely to occur because fish would be expected to modify their behavior and move away from the source upon exposure to underwater noise levels greater than the behavioral effects threshold (SPL_{rms} = 150 dB re 1 μPa). Fish would be exposed to levels of noise that cause behavioral modification at 50 m (164 ft) according to the model estimate and would be expected to move away from the sound source before cumulative exposure could result in injury. If a fish were within 30 m (98 ft) of the pile at the time pile driving begins, it likely would leave the area quickly. Additionally, the use of a soft start technique should also give any fish in the area time to move out of the range of any potential injury from noise. Therefore, noise injury to fish is not anticipated.

Behavioral effects, such as avoidance of the area or disruption of foraging activities, may occur in fish exposed to noise above the behavioral threshold (SPL_{rms} = 150 dB re 1 μPa). Underwater noise levels are predicted to be below this threshold at distances beyond approximately 50 m (164 ft) from the pile being installed. As discussed above, it is reasonable to assume that a fish within the action area that detects underwater noise levels of 150 dB re 1 µPa would modify its behavior and redirect its course of movement away from the noise source. It is extremely unlikely that these movements would affect essential behaviors such as spawning, foraging, resting, or migration. The bays and waterways of the Project Area are sufficiently extensive to allow fish to avoid the area of elevated noise while continuing to forage and migrate. Given the small distance that a fish would need to move to avoid disturbing levels of noise, any effects would not be measurable or detectable and, therefore, would be insignificant.

A soft-start procedure would be used for pile driving to allow fish that may be in the Project Area to detect the presence of noise-producing activities and to depart the area before full-power pile driving begins. A bubble curtain around each pile being driven could be used for noise attenuation (see Section 4.2). The estimated effects of using a bubble curtain were not included in the modeling of threshold distances.

Noise generated by vessels during project construction or vessels calling on the pier during its operation potentially could affect fish in the Project Area. The area is already affected by anthropogenic noise from vessels and other sources. Construction and use of the pier would cause additional noise in the area. The noise produced by vessels during construction would vary depending on the vessel size, speed, and whether it uses dynamic positioning thrusters. Noise from vessels traveling to and from the pier potentially would cause behavioral disturbance to fish but would not result in injury. When vessels are underway in open waters, fish in adjacent areas could be disturbed. However, construction vessels and vessels visiting the pier during operation would be shallow-draft, slow-moving, and likely would produce noise levels less than the behavioral effects level for fish. Dredging would also produce underwater noise. Noise from project vessels during construction and operation would not be expected to potentially cause more than local and temporary behavioral responses in fish if present nearby. These effects would be less than significant.

Due to the increase in vessel traffic associated with the proposed port facilities, there would be an increased potential for vessel strikes on fish that could result in mortality or injury. Vessel collisions are more likely to affect fish species that have surface feeding or resting habits. However, any increase in vessel traffic would be small in the context of existing vessel traffic in the area, and fish are highly mobile and would be anticipated to avoid the relatively slow-moving vessels visiting the pier. As a result, corresponding impacts on fish from vessel strikes would be small.

Benthic Community

The benthic community in the vicinity of the proposed pier and dredging would be disturbed from pile driving and dredging during construction of the Proposed Action and maintenance dredging during operation of the pier facility. The area of marsh and open water bottom beneath the pier would be approximately 0.4 ha (1 ac) in Phase 1 and 0.6 ha (1.5 ac) in Phase 3. The areas to be dredged, including turning basins and channels, would be approximately 13.8 ha (34 ac) in Phase

1, 1.6 ha (4 ac) in Phase 2, and 13.4 ha (33 ac) in Phase 3. Thus, the maximum area to be dredged through all phases of the Proposed Action would be approximately 13.8 ha (34 ac), and the total area affected by both the pier and dredging would be approximately 14.4 ha (0.6 + 13.8 ha), or 36 ac (1.5 + 34 ac). Maintenance dredging of the basin and channel would be repeated periodically as necessary to maintain the required depth and is expected to be infrequent and of short duration. Potential effects could include increased turbidity from suspended silt/sand particles in the immediate vicinity of the dredging, which may temporarily interfere with invertebrate respiration and feeding. Conditions would return to a pre-disturbance condition once particles disperse in the water column and/or settle to the bottom. Any effects on water quality from construction activities or increases in turbidity would be highly localized and temporary.

Dredging impacts to benthic invertebrates would occur from direct entrainment (being captured by the dredge bucket), increased turbidity, and subsequent sedimentation. Eggs, larval stages, and sessile or sedentary species typically are most susceptible to entrainment (LaSalle et al. 1991). Entrainment rates tend to be low but are typically found to be more problematic in cutter/suction dredging, due to its continuous nature, than in clamshell bucket dredging. Dredging along the channel and basin may impact privately leased oyster beds (aquaculture).Dredging activities would follow the existing deep water channel. As shellfish beds are limited to shallower waters, no direct impacts would be anticipated to leased shellfish beds. Indirect impacts from turbidity would be short-term and transient. Turbidity impacts would be mitigated by dredging during slack tides (i.e., dredging the western portion of the channel during flood tide, and dredging the eastern portion of the channel during ebb tides). Additionally, dredging would maintain buffers of a minimum of twice the dredge cut from nonvegetated tidal wetlands and four times the dredge cut from vegetated tidal wetlands (see Section 4.2).

Generally, high levels of suspended solids and long exposure times produce the greatest mortality to benthic invertebrates. Increases in turbidity from dredging are generally like those during strong storm events so estuarine organisms have adapted to a wide range of turbidities. Decreased visibility could lead to increased predation risk for some species and could impact species that rely on phytoplankton and filter feeding by damaging feeding structures or reducing feeding efficiency (Erftemeijer and Lewis 2006).

The re-suspension of anoxic sediments can also reduce dissolved oxygen content in the immediate vicinity of the dredging operation, with deeper areas typically having lower dissolved oxygen than surface areas (LaSalle et al. 1991). This impact is generally short-lived due to mixing, but it may be more of an issue if the area being dredged is tidally restricted or slack water. Relatively immobile benthic invertebrates could be adversely impacted or killed if extended periods of low dissolved oxygen occur. However, turbidity control measures, such as turbidity curtains (also referred to as sediment curtains) could be implemented to prevent suspended sediments from exceeding water quality standards.. Turbidity curtains could be employed when dredging operations approach leased shellfish lands. The only leased land that may be affected by turbidity could be the northwest corner of Oyster Lease 17290. If the use of turbidity curtains is not possible due to current velocities, dredging would be conducted during slack tides (i.e., on the western portion of the channel during flood tide and the eastern portion of the channel during ebb tides) (see Section 4.2).

The use of turbidity curtains around the pier construction area and the basin and access channel dredging areas would reduce or eliminate the potential impacts from sediments that may be released at the point of construction. Thus, the areas of benthic community that would be affected by turbidity from the Proposed Action would be minimal in comparison to the extensive surrounding areas, and effects on this community that may occur in the Project Area would be of short duration.

As discussed in Section 3.7.1.2, the benthic infaunal community of the Project Area is low in abundance of organisms and diversity of taxa. The community is dominated by opportunistic species, mainly polychaete worms, that can rapidly recolonize disturbed habitat (AECOM 2021). Therefore, it is anticipated that this area would be recolonized within a short period of time after completion of the Project. Because the disturbance of benthic habitat would affect a relatively small amount of the Project Area and given the temporary nature of the disturbance, the Proposed Action is expected to result in negligible reductions in benthic invertebrate populations (NOAA Fisheries 2020b).

Portions of the benthic community surrounding Ballast Narrows could be disturbed by the movement and anchoring of barges. Barges would be positioned, and barge anchors deployed in such a manner as to avoid disturbance to oyster beds to the maximum extent practicable. Disturbance of the subaqueous bottom would not affect the long-term viability of the benthic community in those areas.

Accidental spills of fuel, oil, hydraulic fluid, or other potentially hazardous substances would be prevented or minimized through the contractor's adherence to spill prevention and control measures, as specified in WFF's ICP and the project-specific Spill Prevention, Control, and Countermeasure Plan (see Section 4.2).

Ambient noise levels would increase near construction and dredging locations. Noise effects on aquatic species would be temporary and would occur during limited periods while the equipment is being operated. Some invertebrates that are a food source for other aquatic species may be directly affected through their avoidance of noise and vibration and/or increases in turbidity. The effects of turbidity and underwater noise on fish, in particular the Atlantic sturgeon, are discussed in Section 3.9.2.2. However, impacts would be temporary and confined to aquatic habitat in the immediate vicinity of activities in Ballast Narrows and Chincoteague Inlet.

As described in Section 2.3.2, the option selected for the placement of dredged material from construction dredging and long-term maintenance dredging is the pumping of the material from transport barges onto the beach in the SERP area. The elements of the ongoing project to protect Wallops Island shoreline infrastructure through beach renourishment are described in detail in the *SERP EA* (NASA 2019c). The dredged material placement activities of the Proposed Action would be coordinated with and incorporated into the ongoing SERP activities. Effects from the placement of sand material on the beaches and associated impacts on aquatic organisms, principally benthic invertebrates that occur within beach habitats, were evaluated in the *SERP EA*.

The *SERP EA* concluded that during beach renourishment there would be some temporary impacts on the beach invertebrate community. Organisms living in the sandy beach area of the northern part of Wallops Island would experience direct mortality from the dredged material placement. This would be due to burial in the former borrow area and renourishment area and disturbance and crushing from equipment moving sand. As discussed in the *SERP EA* (NASA 2019c), it is expected that invertebrates from adjacent areas would recolonize the new beach in a relatively short time (i.e., on the order of 6 to 12 months after renourishment). Over the long term, the physical, oceanographic conditions would be essentially unchanged, and after the renourishment reaches equilibrium, there would be no net change in the physical environment available for benthos (NASA 2019c).

The placement of dredged material on beaches in conjunction with the SERP was found to have short-term adverse effects on the benthic invertebrate community of the beach; however, the effects on the beach benthic community from beach restoration over the long term would likely be less than significant (NASA 2019c).

Aquaculture

Aquaculture areas consisting of private oyster ground leases, public oyster grounds, and public clamming grounds have been designated within the vicinity of the proposed pier, turning basin, and access channel (VMRC 2021). These areas and the in-water components of the Proposed Action are mapped in **Figure 3.7-1**. A portion of the proposed channel east of the turning basin adjoins the border of a private oyster ground lease area along the northern tip of Wallops Island. Dredging or pier construction would not occur directly through any of the nearby oyster beds, preventing significant, direct impacts. Potential temporary disturbances to the subaqueous bottom and shellfish grounds could result from the dredging of the vessel approach channel and turning basin. Temporarily increased turbidity and sedimentation from disturbance of the subaqueous bottom during dredging, boat anchoring, and pile driving would occur, which could deposit sediment over nearby oyster beds and interfere with respiration. There are also possible temporary restrictions on accessing the oyster beds for harvesting while construction is occurring, and project-related vessels are operating in the area.

Short-term and long-term impacts would be temporary and confined to aquatic habitat in the immediate vicinity of activities in Ballast Narrows and Chincoteague Inlet. NASA and VCSFA would implement mitigation measures as necessary during construction to avoid and/or minimize impacts to shellfish grounds and subaqueous bottom. Long-term impacts could occur from sediments disturbed during periodic maintenance dredging of the access channel, and access restrictions during that dredging and/or when MARS Port-related vessels transporting spacecraft components or other sensitive cargo are transiting the area. Maintenance dredging in the Project Area would occur infrequently (i.e., approximately every five years over the 30-year project life), and none of the long-term operational activities associated with the Proposed Action would prevent or impede the continued viability of the nearby oyster beds.

Aquatic Species Summary

In the long-term, the Proposed Action would disturb aquatic species due to vessels using the pier and periodic maintenance dredging of the turning basin and channel. The predominant reaction among mobile marine species would likely be avoidance of the area due to increased human/vessel activity, noise, and similar activities. Section 2.3.5 and **Table 2-3** iterate the anticipated size and number of each vessel trip on an annual basis. Vessel impacts to species are addressed in Sections 3.7.2.2, 3.8.2.2, and 3.9.2.2. There would be an increased potential for vessel strikes that could result in mortality or injury corresponding to the increase in vessel traffic associated with the proposed port facilities, but the increase in vessel traffic would be small in the context of existing vessel traffic in the area, and most aquatic species would be anticipated to avoid these vessels. For comparison, according to the USACE Norfolk District about the Chincoteague Inlet Federal Navigation Project, Chincoteague Inlet serves as the entrance from the Atlantic Ocean to the largest commercial port on the Eastern Shore and supports more than 3,000 vessels a year and the project supports all types of commercial fishing and tourism vessels. As a result, corresponding impacts on aquatic species would not be significant. Periodic maintenance dredging of the channels would also have the potential to affect aquatic species resulting in direct impacts as well as indirect impacts from increased underwater noise and turbidity. This may particularly affect immobile benthic organisms, including the surrounding shellfish beds. However, maintenance dredging events would be infrequent and short in duration, and background conditions would be expected to return quickly. Dredged material would be used in beach restoration as part of the SERP and would have insignificant adverse effects on aquatic species. In the long term, adverse impacts on aquatic species would occur at the individual level rather than the population or species level and would not prevent or delay the continued propagation of any species or population in or around the Project Area. Therefore, long-term, adverse impacts on aquatic species from the Proposed Action would be minor.

Figure 3.7-1. Aquaculture Areas Around Wallops Island

3.7.2.3 *Alternative 1: Phase 1 Only*

Impacts on wildlife in the Project Area from Alternative 1 would be similar to those described for the Proposed Action. However, the extent and intensity of impacts would be smaller relative to the Proposed Action due to Alternative 1's reduced scope. There would be minor short-term impacts on terrestrial and marine life resulting from the removal of habitat as well as disturbance and displacement by construction activities, including associated noise, light, and increased human activity. In the long term, increased vehicle traffic and human activity associated with the proposed MARS Port would have the potential to indirectly disturb wildlife in nearby areas. The predominant reaction from most mobile species would likely be avoidance of the area and vessel traffic. Long-term repeated, indirect impacts would occur from increases in underwater noise and turbidity during each maintenance dredging event, but these impacts would be infrequent and short in duration, and background conditions would return quickly. Impacts would occur at the individual rather than population or species level and would not prevent or delay the continued propagation of any species. Therefore, short-term and long-term impacts on aquatic/marine species from Alternative 1 would be minor.

3.7.2.4 *Alternative 2: Phases 1 and 2 Only*

Under Alternative 2, impacts to wildlife within the Project Area would be similar to those described for the Proposed Action. However, the extent and intensity of impacts would be smaller relative to the Proposed Action due to Alternative 2's reduced scope and overall shorter construction duration, but somewhat greater than Alternative 1. There would be minor short-term adverse impacts on terrestrial and marine life resulting from the removal of habitat as well as disturbance and displacement by construction activities, including associated noise, light, and increased human activity. Dredging would also occur at a reduced scope relative to the Proposed Action but at a greater scope than Alternative 1. In the long term, increased vehicle traffic and human activity associated with the proposed MARS Port would have the potential to indirectly disturb wildlife in nearby areas. The predominant reaction from most mobile species would likely be avoidance of the area and vessel traffic. Long-term repeated indirect impacts would occur from increases in underwater noise and turbidity during each maintenance dredging event, but these impacts would be infrequent, short in duration, and background conditions would return quickly. Impacts would occur at the individual rather than population or species level and would not prevent or delay the continued propagation of any species. Therefore, short-term and long-term impacts on aquatic/marine species from Alternative 2 would be minor.

3.8 Essential Fish Habitat

Essential Fish Habitat (EFH) is defined in the Magnuson–Stevens Fishery Conservation and Management Act of 1976 (MSA) as "those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity." The "fish" for which EFH has been identified are those fish and invertebrate species that have federally managed fisheries. EFH may be designated for an individual species or an assemblage of species.

Habitat Areas of Particular Concern (HAPC) are defined by the MSA as subsets of EFH that exhibit one or more of the following traits: rare, stressed by development, provide important ecological functions for federally managed species, or especially vulnerable to anthropogenic (i.e., human) degradation. They can cover a specific location (e.g., a bank or ledge, spawning location) or habitat that is found at many locations (e.g., coral, nearshore nursery areas, or pupping grounds). The HAPC designation helps prioritize conservation efforts and does not confer additional protection or restrictions upon a designated area (NOAA Fisheries 2020c).

Federal agencies must consult with NOAA Fisheries in accordance with the MSA for activities that have the potential to adversely affect EFH or HAPC. On December 13, 2022, NASA submitted a consultation letter to NOAA Fisheries regarding potential impacts to EFH in the Project Area.

3.8.1 Affected Environment

EFH has been designated for life stages of 11 fish species in waters near NASA WFF where components of the Proposed Action would be implemented. These species and life stages are summarized in **Table 3.8-1**.

Table 3.8 1. Species and Life Stages with Designated EFH in Waters Where the Proposed Action Would Occur

Species Common Name (Scientific Name)	Life Stage[1, 2]		
	Larvae/ Neonates	Juveniles	Adults
Atlantic butterfish (*Peprilus triacanthus*)		X	X
Atlantic herring (*Clupea harengus*)			X
Black sea bass (*Centropristis striata*)		X	X
Bluefish (*Pomatomus saltatrix*)		X	X
Clearnose skate (*Raja eglanteria*)		X	X
Sand tiger shark (*Carcharias taurus*)[3]	X	X	X
Sandbar shark (*Charcharinus plumbeus*)[3]	X	X	
Smoothhound shark complex – Atlantic stock (*Mustelus canis*)[3]	X	X	X
Summer flounder (*Paralicthys dentatus*)		X	X
Windowpane flounder (*Scophthalmus aquosus*)			X
Winter skate (*Leucoraja ocellata*)		X	X

[1] EFH for the egg life stage is not designated in waters near WFF for any species.
[2] An "X" indicates that EFH has been designated within the Proposed Action area for that species and life stage.
[3] The three shark species listed in this table bear live young (neonates) and do not have a free-swimming larval stage.
Source: NOAA Fisheries 2020d

EFH for each of the species listed in **Table 3.8-1** covers thousands of square miles of estuarine, inshore, coastal, and offshore waters generally extending from Maine to Florida, with smaller ranges (e.g., Massachusetts to North Carolina) designated for some species within that larger area.

Some species, such as Atlantic herring and black sea bass, prefer deeper and/or colder offshore waters and, except for infrequent, transient individuals, are unlikely to occur in waters near WFF. Other species, such as flounders, sharks, and skates, prefer shallower, warmer coastal and inshore waters and therefore may occur near WFF with greater frequency. Based on their preference for warmer, shallower coastal waters, flounders may occur near WFF with the highest frequency of the species listed in **Table 3.8-1**. As indicated in **Table 3.8-1**, EFH for the egg life stage has not been designated near WFF for any EFH species; therefore, none of these species are expected to spawn in waters adjacent to or near WFF (MAFMC 2011, NEFMC and NOAA Fisheries 2017, MAFMC 1998a, MAFMC 1998b, NOAA Fisheries 2017).

HAPC for summer flounder is defined as all native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations, within adult and juvenile summer flounder EFH (MAFMC 2016). Summer flounder HAPC is not known to be present in the waters near NASA WFF where components of the Proposed Action would be implemented.

None of the species listed in **Table 3.8-1** are designated as federally listed threatened or endangered species, and no federal critical habitat has been designated for any of these species in waters near NASA WFF.

3.8.2 Environmental Consequences

An adverse effect on EFH would be considered significant if the effect would permanently destroy or degrade the viability of designated EFH for any of the species life stages listed in **Table 3.8-1**, and/or if the effect could not be resolved through mitigation measures implemented in consultation with NOAA Fisheries and/or other applicable regulatory agencies.

3.8.2.1 *No Action Alternative*

The No Action Alternative would have no impacts on EFH because none of the activities included in the Proposed Action would be implemented. Existing conditions at and around NASA WFF would continue as previously analyzed in consultation with NOAA Fisheries.

3.8.2.2 *Proposed Action: Phases 1, 2, and 3*

NASA completed the NOAA Fisheries' EFH Assessment Worksheet (NOAA Fisheries 2019) for the Proposed Action to support consultation with NOAA under the MSA. The worksheet includes detailed information about the marine and estuarine habitats of the waters where the Proposed Action would occur and the functions and values those habitats provide for the life stages of the EFH species potentially occurring in those habitats. The worksheet also details the potential impacts of the Proposed Action on EFH for the species in **Table 3.8-1**. Results of the EFH Assessment Worksheet determined that potential adverse effects on EFH would not be substantial. A copy of the EFH Assessment Worksheet is included in **Appendix D**.

On-shore, extending the culvert under the UAS Airstrip access road would result in temporary turbidity and noise impacts to EFH. However, following construction, the culvert extension would maintain the hydrologic connection of the stream on either side of the roadway and would not interfere with fish passage.

In the short term, in-water activities associated with components of the Proposed Action (i.e., pier construction/pile driving, increased vessel traffic and human activity, and dredging of the turning basins and access channels) would result in adverse impacts to EFH. Impacts to EFH would depend on the season during which construction and dredging occurred and the life stages of species with designated EFH that occupy the Project Area. Dredging may result in entrainment of fish and invertebrates that might otherwise be consumed as prey. Construction and dredging activities would temporarily degrade conditions supporting EFH by physically disturbing the subaqueous bottom of Ballast Narrows and Chincoteague Inlet and/or disturbing and dispersing sediments into the water column. Disturbance of the subaqueous bottom would have the potential to inadvertently destroy EFH and alter substrates. Corresponding sediment disturbance would potentially increase turbidity, reduce visibility, diffuse natural light, and/or smother vegetation that provides EFH. Wilbur and Clarke (2001) found that effects from re-suspension of sediments varied widely among marine species. Generally, high levels of suspended solids and long exposure times produced the greatest mortality. Adverse impacts on EFH from turbidity and sedimentation are unlikely, as the dredging activity would be short in duration and would not involve a large area of EFH.

The re-suspension of anoxic sediments can also reduce dissolved oxygen content in the immediate vicinity of the dredging operation, with deeper areas typically having lower dissolved oxygen than surface areas (LaSalle et al. 1991). This impact is typically short-lived due to mixing, but it may be more of an issue if the area being dredged is tidally restricted or slack water. The fish species with designated EFH in the Project Area are highly mobile and would likely relocate temporarily to other habitat areas to avoid areas of elevated turbidity and reduced dissolved oxygen. Generally, impacts to EFH from increased turbidity are unlikely.

Disturbance of wetlands and fringe areas under the Proposed Action could lead to further invasion by *Phragmites* into EFH, which could indirectly affect fish. *Phragmites* typically outcompetes native wetland vegetation and changes the function of the habitat it invades. As *Phragmites* becomes dominant, standing water is reduced, intertidal creeks are filled, and topography is raised such that the area is flooded only rarely, eventually eliminating all habitat functions. Given that regular flooding by saltwater restricts *Phragmites* development to higher tidal elevations, it is expected that the areas of greatest risk for colonization would be the marsh fringes around the pier and placement sites for dredged material. NASA and VCSFA would implement the *Phragmites Control Plan* (NASA 2014a) to limit the potential propagation of *Phragmites* in these areas.

Long-term, in water adverse impacts would include permanent conversion of salt marsh and estuarine habitat within the footprint of the pilings, and shading of habitats beneath the pier. Shading of these habitats would inhibit plant growth and reduce the presence of wetland and underwater vegetation that may provide EFH.

The *SERP EA* evaluated the potential effects on EFH and managed fishery species associated with the range of SERP activities, including the dredging of offshore shoals to obtain sand material for beach renourishment, excavation of an onshore sand borrow area, and placement of the material on the beaches being restored. Dredging of the shoals was identified as the predominant shoreline restoration activity with the potential to impact EFH. The assessment concluded that the SERP would not substantially adversely affect EFH, and NOAA Fisheries concurred (NOAA Fisheries 2018a). The SERP activity that would occur under the Proposed Action is the placement of dredged material on beaches, and this activity was not found to have adverse effects on EFH. Therefore, potential effects on EFH from the placement of dredged material on the beach are not evaluated further.

EFH Summary

While these effects would be adverse, they would generally be localized to adjacent or nearby areas of Ballast Narrows and Chincoteague Inlet, and their extent, intensity, and duration would vary throughout the Proposed Action's multi-year and multi-phase implementation period. Over the past 30 years, only small portions of the Chincoteague Inlet have been dredged each year, removing dredge volumes of approximately 2,300 to 94,000 m^3 (3,000 to 123,000 yd^3) over a period of one day to two months per event (USACE 2017). This would prevent short-term adverse effects from occurring simultaneously. The primary response by individuals of the EFH species listed in **Table 3.8-1** would likely be to avoid the areas where these activities would be occurring, particularly in response to increased noise, human activity, and vessel traffic. Some species or individuals that are conditioned to a higher degree of disturbance or human activity could continue to inhabit the area with no or minimal changes in behavior, while others may avoid the area entirely. It is likely that most individuals would temporarily relocate during periods of construction or dredging to other nearby areas offering similar habitat conditions.

In the context of designated EFH habitat for these species along the Atlantic coastline, the area where these activities would occur would be exceedingly small. The total area of marsh and open water bottom beneath the pier would be approximately 0.4 ha (1 ac) in Phase 1 and 0.6 ha (1.5 ac) in Phase 3. The areas to be dredged, including turning basins and channels, would be approximately 13.8 ha (34 ac) in Phase 1, 1.6 ha (4 ac) in Phase 2, and 13.4 ha (33 ac) in Phase 3. Thus, the maximum area to be dredged through all phases of the Proposed Action would be approximately 13.8 ha (34 ac), and the total area affected by both the pier and dredging would be approximately 14.4 ha (0.6 + 13.8 ha), or 36 ac (1.5 + 34 ac). Maintenance dredging of the basin and channel would be repeated periodically as necessary to maintain the required depth and is expected to be infrequent and of short duration.

Substantial areas of undisturbed EFH would remain outside the Project Area during implementation of the Proposed Action. Effects from the proposed in-water construction activities would occur at the individual rather than population or species level and would not prevent or delay the continued propagation of any species. Short-term construction activities would not destroy or substantially degrade EFH. Contractors would incorporate and adhere to BMPs, such as the use of sediment and noise curtains, minimizing vessel engine idling to the extent possible, and using a hammer soft-start procedure during pile driving. To further minimize impacts, NASA would also adhere, to the maximum extent practicable, to conservation recommendations provided by NOAA Fisheries in the Letter of Concurrence dated February 13, 2023 and summarized below in Section 4.2 (**Appendix D**). Temporarily disturbed subaqueous bottom areas would return to preconstruction conditions through normal tide cycles and settling of silt and sediments. Therefore, short-term impacts on EFH from the Proposed Action would be minor and less than significant.

In the long term, the operation of the proposed MARS Port would not involve the intentional disturbance of EFH in nearby or adjacent waters. Increased vessel traffic (**Table 2-3**) and human activity, and periodic maintenance dredging of the turning basin and access channel could discourage some individuals or species from inhabiting the area. However, these activities and their potential effects would involve a localized area and would not permanently destroy or degrade EFH or HAPC. Individuals or species disturbed by these activities would be expected to relocate to other nearby areas offering similar habitat conditions. Consultation conducted with NOAA Fisheries did not identify any potential impacts to EFH from operational activities (**Appendix D**). Section 2.3.5 and **Table 2-3** iterate the anticipated size and number of each vessel trip on an annual basis. Vessel impacts to species are addressed in Sections 3.7.2.2, 3.8.2.2, and 3.9.2.2. According to the USACE Norfolk District about the Chincoteague Inlet Federal Navigation Project, Chincoteague Inlet serves as the entrance from the Atlantic Ocean to the largest commercial port on the Eastern Shore and supports more than 3,000 vessels a year and the project supports all types of commercial fishing and tourism vessels. Extensive, undisturbed areas of EFH would also remain available nearby in waters outside the Project Area. The operation of the proposed MARS Port would not prevent or impede the continued propagation of any population or species. For these reasons, long-term impacts on EFH and HAPC would be negligible and less than significant.

3.8.2.3 *Alternative 1: Phase 1 Only*

Short-term and long-term impacts on EFH from Alternative 1 would be similar to those described for the Proposed Action. However, the extent, duration, and intensity of impacts would be smaller due to Alternative 1's reduced scope. Temporary impacts from construction activities associated with Alternative 1, such as pile driving, pier construction, and channel and basin dredging, would be minimized through adherence to applicable BMPs. Temporarily disturbed subaqueous bottom areas would return to preconstruction conditions through normal tide cycles and settling of silt and sediments. Short-term construction and long-term operational activities associated with Alternative 1 would affect an exceedingly small area of designated EFH relative to available areas elsewhere along the Atlantic coast (total area to be dredged in Phase 1 of the Proposed Action would be approximately 13.8 ha [34 ac]), would have negligible potential to destroy or degrade the viability of EFH in the Project Area, and would not prevent or delay the continued propagation of any population or species. Individual fish disturbed by the proposed activities would likely relocate to other nearby areas offering suitable habitat conditions. Therefore, short-term and long-term impacts on EFH from Alternative 1 would be negligible and less than significant.

3.8.2.4 *Alternative 2: Phases 1 and 2 Only*

Short-term and long-term impacts on EFH from Alternative 2 would be similar to those described for the Proposed Action, but the extent, duration, and intensity of impacts would be lower relative to the Proposed Action due to the reduced scope and construction period of Alternative 2. Relative to Alternative 1, this alternative would have greater short-term and long-term impacts due to the extent, duration, and intensity of the alternative. The implementation of Alternative 2 would involve a total of area of 15.4 ac [38 ha] being dredged (i.e., 13.8 ha [34 ac] in Phase 1 and 1.6 ha [4 ac] in Phase 2), an exceedingly small area of designated EFH relative to available areas elsewhere along the Atlantic coast. It would have a negligible potential to destroy or degrade the viability of EFH in the Project Area and would not prevent or delay the continued propagation of any population or species. Individual fish disturbed by the proposed activities would likely relocate to other nearby areas offering suitable habitat conditions. Therefore, short-term and long-term impacts on EFH and HAPC from Alternative 2 would be negligible and less than significant.

3.9 Special-Status Species

This section addresses species that have a special status that provides them legal protection based on the following federal or state legislation.

<u>Endangered Species Act (ESA)</u> (16 U.S.C. §§ 1531-1544, as amended): Section 7 of the federal ESA requires federal agencies to consider the effects of their actions on federally listed species and designated critical habitat, and to take steps to conserve and protect these species and habitats. The requirements of ESA Section 7 are administered by the USFWS, which principally has jurisdiction over terrestrial and freshwater aquatic species (as well as sea turtles when nesting onshore), and by NOAA Fisheries, which principally has jurisdiction over marine species (including sea turtles when in water).

<u>Virginia ESA</u> (29 VAC 1-563–29.1-570): The Virginia ESA prohibits the taking, transport, processing, sale, or offer for sale of any federally or state-listed threatened or endangered species. NASA voluntarily complies with Virginia's ESA and recognizes species listed by the Commonwealth of Virginia as being at potential risk of extinction.

<u>Bald and Golden Eagle Protection Act (BGEPA)</u> (16 U.S.C. §§ 668-668c): Although delisted under the federal ESA in 2007, the bald eagle (*Haliaeetus leucocephalus*) remains protected under the BGEPA. The BGEPA prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, which includes molesting or disturbing the birds or their nests or eggs.

<u>Migratory Bird Treaty Act (MBTA)</u>: As discussed above under wildlife, birds protected under the MBTA include essentially all bird species that occur in the region, including a subset of species considered by USFWS to be BCC. MBTA-protected species are not addressed further in this EA because the Proposed Action would not involve the intentional take of migratory birds and would not have significant adverse effects on populations of BCC or other migratory birds.

Marine Mammal Protection Act (MMPA) of 1972 (16 U.S.C. §§ 1361-1421h): The MMPA establishes requirements for federal agencies to prevent or minimize effects from their actions on marine mammals. The MMPA prohibits the "taking" of marine mammals in the United States or on the high seas, subject to limited exceptions. NOAA Fisheries exercises MMPA jurisdiction over the majority of marine mammal species found worldwide, including whales, dolphins, porpoises, seals, and sea lions. USFWS is responsible for MMPA management of certain other marine mammals (i.e., manatees, dugongs, polar bears, sea otters, and walruses).

3.9.1 Affected Environment

The special status species that may occur in the affected environment of the Project Area are discussed below. The species are grouped for discussion according to the basis of their special status as follows: 3.9.1.1 federal or state ESA listed species, 3.9.1.2 bald eagle, 3.9.1.3 migratory birds, and 3.9.1.4 marine mammals.

3.9.1.1 *Federal or State ESA Listed Species*

Species with a federal or state ESA listing status that are known or have the potential to occur in the Project Area are included in **Table 3.9-1**. For each species, the table provides information about the types of habitat preferred by the species, information about its potential or documented occurrence in the Project Area, and the ESA Section 7 effects determination for the species, which is based on the analysis presented in this EA. NASA has consulted with USFWS and NOAA Fisheries regarding the Proposed Action's potential effects on federally listed threatened and endangered species; both agencies have concurred with NASA's determinations of effects. Additional information about the species in **Table 3.9-1** is provided in Section 3.10 of the *Final Sitewide PEIS* (NASA 2019a). The ESA Section 7 effects determination for all species was either no effect or may affect but not likely to adversely affect. Thus, under NEPA the effects of the Proposed Action on each species would be less than significant.

NASA has consulted with the USFWS and NOAA Fisheries under Section 7 of the ESA regarding potential impacts to protected species. NASA contacted these agencies in letters dated November 3, 2021 (**Appendix E**) requesting concurrence with the determination of effects for each of the federally listed species under USFWS and NOAA Fisheries jurisdiction, respectively, potentially occurring in the Project Area. Based on the responses received from these agencies, NASA reinitiated consultation with USFWS and NOAA Fisheries on December 13, 2022, (**Appendix E**) to address concerns and new species updates. In letters dated February 28, 2023, and March 3, 2023, NOAA Fisheries and USFWS, respectively, concurred with NASA's determinations that the Proposed Action is not likely to adversely affect listed species.

For six of the species with a federal and/or state ESA listing status in **Table 3.9-1**, it was determined that the Proposed Action would have no effect on the species: northeastern beach tiger beetle (*Cicindela dorsalis dorsalis*), seabeach amaranth (*Amaranthus pumilus*), loggerhead shrike (*Lanius ludovicianus*), roseate tern (*Sterna dougallii dougallii*), Wilson's plover (*Charadrius* *wilsonia*), and gull-billed tern (*Gelochelidon nilotica*). These species have never been documented at NASA WFF or Wallops Island and are unlikely to occur in the habitats that would be affected by the Proposed Action. The monarch butterfly (*Danaus plexippus*), which recently became a candidate for federal listing, also would not be affected. Therefore, these species are not addressed further in this EA.

For the other 13 species with a federal and/or state listing status in **Table 3.9-1**, it was determined that the Proposed Action may affect but is not likely to adversely affect each species. Additional discussion of these species of bats, birds, sea turtles, and fish and the basis for this determination are provided below.

In 2019, USFWS issued a combined Biological Opinion (BO) for Proposed and Ongoing Operations and Shoreline Restoration/Infrastructure Protection Program at WFF (USFWS 2016). As part of the terms and conditions of the BO, to manage special-status species WFF annually updates and administers a *Protected Species Monitoring Plan*. The plan outlines procedures for monitoring protected species that are likely to occur at Wallops Island, including the rufa red knot, piping plover, northern long-eared bat, nesting sea turtles, and seabeach amaranth. Monitoring reports for these species are prepared annually by WFF and are submitted to the USFWS (NASA 2019a). In response to consultation conducted with the USFWS for this Proposed Action, the BO will be updated to include new time-of-year restrictions to minimize adverse impacts to bats and shorebirds.

Table 3.9 1. Federally and State Listed Species with Potential to Occur in the Project Area and Determination of Effects

Common Name	Scientific Name	Status[1]	Habitat Type	Potential Occurrence in Project Area	ESA Section 7 Determination of Effect
Terrestrial Mammal					
Northern long-eared bat[2]	*Myotis septentrionalis*	FE, ST	Summer: Under bark, or in cavities or crevices of live and dead trees Winter: Caves and mines	Suitable habitat is present at WFF; however, no *Myotis* guild was detected during bat acoustic and netting surveys conducted in 2017 and 2018. Additionally, no maternity roost trees or winter hibernacula suitable for the species have been documented at or near Wallops Island (VDGIF 2022).[2] In accordance with the 2019 Biological Opinion, NASA and VSCFA would not remove identified maternity roost trees. Any required tree clearing would comply with time-of-year restrictions from April 1 to November 14.	May affect, not likely to adversely affect
Tricolored bat	*Perimyotis subflavus*	Proposed endangered[3]	Summer: Trees, primarily among leaves Winter: Caves and mines	Suitable summer habitat is present at WFF and bat surveys conducted between 2016 and 2018 identified relatively high species activity at WFF (Barr 2018). NASA and VCSFA would not remove identified maternity roost trees. Any required tree clearing would comply with time-of-year restrictions from April 1 to November 14.	May affect, not likely to adversely affect
Terrestrial Invertebrates					
Northeastern beach tiger beetle	*Cicindela dorsalis dorsalis*	FT, ST	Sandy beaches and dunes	Recently documented in Virginia, and only on Chesapeake Bay beaches; closest beach known to be occupied by species is approximately 14 mi west of WFF (USFWS 2011). Potential habitat in project area is primary dunes or beaches, which would be increased by dredged material placement.[2]	No effect
Terrestrial Plant					
Seabeach amaranth	*Amaranthus pumilus*	FT, ST	Area seaward of primary dunes	Species has not been documented at WFF since monitoring began in 2010 (NASA 2021); nearest documented occurrence is on Assateague Island (NASA 2019a). Potential habitat in project area is primary dunes or beaches, which would be increased by dredged material placement.[2]	No effect

Table 3.9 1. Federally and State Listed Species with Potential to Occur in the Project Area and Determination of Effects

Common Name	Scientific Name	Status[1]	Habitat Type	Potential Occurrence in Project Area	ESA Section 7 Determination of Effect
Birds					
Rufa red knot	*Calidris canutus rufa*	FT, ST	Wallops Island beaches	Present May through July during spring migration. Regularly forages on Wallops, Assateague, and Assawoman Island beaches during northerly spring migration (NASA 2019a). In May 2019, over 2000 birds were counted on the north end of Wallops Island (NASA 2019b). Numbers observed on the north end of Wallops Island were 117 in 2020, 0 in 2021, 622 in 2022 (NASA 2022). Dredged material placement would occur on beaches and potentially would increase beach habitat, and Phase 1 placement would comply with time-of-year restrictions from March 15 to August 31.	May affect, not likely to adversely affect
Piping plover	*Charadrius melodus*	FT, ST	Sandy beaches and tidal flats along the Wallops Island shoreline	Transient and summer resident of the upper Virginia barrier islands. Regularly nests and forages on Wallops, Assateague, and Assawoman Island beaches (NASA 2019a). Three nests were observed on Wallops Island in 2021 and 2022 (NASA 2022). Dredged material placement would occur on beaches within piping plover habitat and potentially would increase beach habitat, and Phase 1 placement would comply with time-of-year restrictions from March 15 to August 31. Activities would be monitored daily and a 305-m (1,000-ft) nest buffer would be established.	May affect, not likely to adversely affect
Roseate tern[2]	*Sterna dougallii dougallii*	FE, SE	Offshore ocean waters	Rarely observed along the U.S. coast south of New Jersey; may transit over oceanic waters off WFF during seasonal migration (NASA 2019a)[2].	No effect
Eastern black rail	*Laterallus jamaicensis jamaicensis*	FT, SE	Salt and brackish marshes with dense cover and upland areas of such marshes	Species has recently been documented at WFF and potentially suitable habitat is present at and near WFF. However, no call-responses were detected in surveys conducted in 2021 and 2022 surrounding Wallops Island (WEST 2021; WEST 2022).	May affect, not likely to adversely affect

Table 3.9 1. Federally and State Listed Species with Potential to Occur in the Project Area and Determination of Effects

Common Name	Scientific Name	Status[1]	Habitat Type	Potential Occurrence in Project Area	ESA Section 7 Determination of Effect
Wilson's plover[2]	*Charadrius wilsonia*	SE	Similar to piping plover	No active nests recorded on Wallops Island; active nests recorded on Assateague Island and two adjacent islands to the south (NASA 2019a)[2]. Dredged material placement would occur on beaches and potentially would increase beach habitat.	No effect
Peregrine falcon	*Falco peregrinus*	ST	Elevated naturally occurring and human-made structures, almost always near water	One peregrine falcon nesting tower installed on the west side of north Wallops Island and has been historically used by a pair of falcons. Tower is approximately 0.9 km (0.6 mi) southwest of Proposed Action area. May occur on WFF Wallops Island during migration.	May affect, not likely to adversely affect
Loggerhead shrike[2]	*Lanius ludovicianus*	ST	Open country with scattered shrubs and trees, but also more heavily wooded habitats with large openings and in very short habitats with few or no trees (Cornell University 2019)	Historic occurrence in Accomack County; however, recent Virginia occurrences have only been in the Shenandoah Valley (NASA 2019a)[2].	No effect
Gull-billed tern[2]	*Gelochelidon nilotica*	ST	Breeds on gravelly or sandy beaches. Winters in salt marshes, estuaries, lagoons and plowed fields, less frequently along rivers, around lakes and in fresh-water marshes	No active nests recorded on Wallops Island; nests have been recorded on Assateague Island (NASA 2019a)[2].	No effect

Table 3.9 1. Federally and State Listed Species with Potential to Occur in the Project Area and Determination of Effects

Common Name	Scientific Name	Status[1]	Habitat Type	Potential Occurrence in Project Area	ESA Section 7 Determination of Effect
Reptiles (Sea Turtles)					
Loggerhead sea turtle	*Caretta caretta*	FT, ST	Coastal and offshore ocean waters; Wallops and Assateague Island beaches	Most prevalent sea turtle species around WFF; has nested on Wallops and regularly nests on Assateague Island beaches (NASA 2019a; USFWS 2016). Loggerhead nests have been observed on Wallops Island beaches as recently as 2013. Greatest in-water concentrations over continental shelf ; however, species is also found in deeper waters (NASA 2019a). Proposed Action unlikely to affect species; construction activity not located in nesting habitat, and dredged material placement on beaches would avoid turtle nests and potentially increase beach area for nesting. Activities would be monitored daily and a 305-m (1,000-ft) nest buffer would be established. Due to the transient presence of the species, dredging operations are unlikely to affect the loggerhead sea turtle. Potential occurrence in Project Area: adults and juveniles migrating and foraging May–November (NOAA Fisheries 2020e). Turtles may stay through early winter (December - January) if water temperatures remain warm (VDWR 2016, Martin 2022).	Nesting: may affect, not likely to adversely affect. In water: may affect, not likely to adversely affect
Leatherback sea turtle	*Dermochelys coriacea*	FE, SE	Coastal and offshore ocean waters	Nesting in the Project Area is unlikely; only one individual demonstrating nesting behavior documented on Assateague Island in 1996; no nesting documented in the Project Area. Generally considered oceanic; however, will forage in coastal areas if prey species are available in high densities (NASA 2019a). Potential occurrence in Project Area: adults and juveniles migrating and foraging May–November (NOAA Fisheries 2020e). Turtles may stay through early winter (December - January) if water temperatures remain warm (VDWR 2016, Martin 2022).	Nesting: no effect. In water: may affect, not likely to adversely affect

Table 3.9 1. Federally and State Listed Species with Potential to Occur in the Project Area and Determination of Effects

Common Name	Scientific Name	Status[1]	Habitat Type	Potential Occurrence in Project Area	ESA Section 7 Determination of Effect
Hawksbill sea turtle	*Eretmochelys imbricata*	FE, SE	Coastal ocean waters	Unlikely to occur in or near the Project Area; only two observations in Virginia since 1979 (NASA 2019a).	Nesting: no effect. In water: may affect, not likely to adversely affect
Kemp's ridley sea turtle	*Lepidochelys kempii*	FE, SE	Coastal ocean waters	Traditionally nests in Mexico; however, first Virginia nest discovered in 2012 at Virginia Beach (Virginia Army National Guard 2019), with a second nest at False Cape in summer 2014 (VDWR 2016). A Kemp's ridley nest also occurred in 2021 at an undisclosed location in Virginia (Argo 2021). No Kemp's ridley nests have been documented in the Project Area. Generally occurs in more sheltered, shallower water habitats than other sea turtle species (NASA 2019a). Potential occurrence in Project Area: adults and juveniles migrating and foraging May–November (NOAA Fisheries 2020e). Turtles may stay through early winter (December - January) if water temperatures remain warm (VDWR 2016, Martin 2022).	Nesting: may affect, not likely to adversely affect. In water: may affect, not likely to adversely affect
Green sea turtle	*Chelonia mydas*	FT, ST	Coastal ocean waters	Green sea turtles have begun nesting in Virginia, and one nested in Virginia in 2021 at an undisclosed location (Argo 2021); green sea turtle nesting has not been documented in the Project Area. Potential occurrence in Project Area: adults and juveniles migrating and foraging from May–November (NOAA Fisheries 2020e). Turtles may stay through early winter (December - January) if water temperatures remain warm (VDWR 2016, Martin 2022).	Nesting: may affect, not likely to adversely affect. In water: may affect, not likely to adversely affect

Table 3.9 1. Federally and State Listed Species with Potential to Occur in the Project Area and Determination of Effects					
Common Name	**Scientific Name**	**Status[1]**	**Habitat Type**	**Potential Occurrence in Project Area**	**ESA Section 7 Determination of Effect**
Fish					
Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*	FE, SE	Spawn in flowing fresh waters of rivers between the salt front and fall line then migrate to estuarine and marine waters as adults	Species has been documented in deeper waters off WFF. Potential occurrence in Project Area: adults and subadults migrating and foraging from January 1 to December 31 (NOAA Fisheries 2020e). Potential for occurrence in Ballast Narrows or Chincoteague Inlet is minimal and is expected to be limited to the occasional transient passage of adults and subadults through the area during migration or while foraging in any month of the year (NOAA Fisheries 2020e).	May affect, not likely to adversely affect
Giant manta ray	*Manta birostris*	FT, ST	Coastal ocean waters	Not identified by NOAA Fisheries ESA Section 7 Mapper as having potential to occur in the area. Species has been observed in estuarine waters, oceanic inlets and bays (NOAA Fisheries 2021a). Has been observed off the coast of Assateague Island (Swann 2018).	May affect, not likely to adversely affect

[1] FE = federally listed as endangered; FT = federally listed as threatened; SE = state-listed as endangered; ST = state-listed as threatened.
[2] This species has not been documented at NASA WFF and is unlikely to be present in the Project Area or affected by the Proposed Action. Therefore, it is not addressed further in this EA.
[3] The tricolored bat was proposed for listing as an endangered species by the USFWS on September 13, 2022. The proposal is still undergoing review.

Northern Long-eared Bat

The northern long-eared bat (*Myotis septentrionalis*) was recently reclassified by the USFWS to an endangered species status. This reclassification is anticipated to go into effect on March 31, 2023, and will also remove the 4(d) rule. The USFWS is in the process of developing new guidance to replace the 4(d) rule and associated determination key. In the summer, the northern long-eared bat is typically found roosting underneath tree bark or in cavities or crevices of both live trees and snags. In the winter, this species hibernates in caves and mines. There is no winter hibernacula on or near Wallops Island and no maternity trees have been identified. Further, this species has not been documented at NASA WFF; it is therefore unlikely to be present in the Project Area.

Tricolored Bat

On September 13, 2022, the USFWS proposed to list the tricolored bat (*Perimyotis subflavus*) as an endangered species throughout its range; a final decision on this proposal is still pending. In the summer, the tricolored bat is typically found roosting in trees, primarily among leaves. In the winter, this species hibernates in caves and mines. Year-round surveys conducted between October 2016 and April 2018 identifed relatively high species activity at NASA WFF during the summer season (Barr 2018).

Eastern Black Rail

The eastern black rail (*Laterallus jamaicensis jamaicensis*) is federally listed as threatened and state listed as endangered. In the northeastern U.S., the eastern black rail typically occurs in salt and brackish marshes with dense cover but can also be found in upland areas of these marshes. Farther south along the Atlantic coast, eastern black rail habitat includes impounded and un-impounded salt and brackish marshes.

The eastern black rail was documented at NASA WFF in May 2019. Suitable marsh nesting and foraging habitat for the species is present on and around areas of the northern end of Wallops Island and Ballast Narrows where components of the Proposed Action would be implemented. Through informal conference with USFWS conducted on August 16, 2019, and subsequent informal conference with USFWS during May and July 2020, avoidance and minimization measures to be employed during construction were agreed upon by NASA, VCSFA, and their contractors, and a habitat survey was requested by USFWS to identify whether an eastern black rail species survey would be needed. A habitat assessment was conducted by AECOM in July-August 2020 (**Appendix E**, *Endangered Species Act Consultation*) and follow-up species presence surveys were performed in June of 2021 and during the breeding season in 2022 (three survey rounds between May 1 and June 6) at locations throughout high marsh habitat on Wallops Island, including survey points in the area of the Proposed Action. Similar to the results of the 2021 survey, no visual or auditory observations of eastern black rails were recorded during the 2022 survey (Stein, Bartok, and Ritzert 2022). NASA anticipates that, through these measures and continued consultation, the species would not likely be adversely affected by the Proposed Action.

Red Knot

The rufa subspecies of the red knot (rufa red knot) (*Calidris canutus rufa*) is federally and state-listed in Virginia as threatened. They do not breed in the vicinity of NASA WFF or Accomack County, but appear regularly on Wallops Island beaches, including those on the northern end of the island to forage and roost during their annual spring migration, mostly during the second half of May (NASA 2015a). In 2019, over 2,000 red knots were observed on the north end of Wallops Island (NASA 2019b).

On July 15, 2021, USFWS proposed designation of critical habitat for the rufa red knot (86 Federal Register 37410). The proposed critical habitat consists of 262,667 ha (649,066 ac) in 120 coastal units (18 of which are further subdivided into 46 subunits) from Massachusetts to Texas. In Virginia, Subunit VA-2A, Wallops Island North, consists of 218 ha (540 ac) that encompass beach habitat and immediate offshore areas extending to a point at the northern tip of the island (**Figure 3.9-1**). This proposed critical habitat subunit does not include the Project Area, which would be located approximately 1 mi west of the critical habitat, well behind the beach and dune habitat favored by the rufa red knot. The vessel approach channel that would be dredged from the Chincoteague Inlet channel to the proposed pier would not cross the proposed critical habitat but would be approximately 0.4 km (0.25 mi) north of the northern tip of the critical habitat at its closest point. NASA has requested exclusion of the two critical habitat subunits on Wallops Island from the final critical habitat designation based on national security impacts.

No beaches are in the Project Area on the northwestern side of Wallops Island where onshore components of the Proposed Action would be implemented. However, narrow beaches along the east side of the northern tip of the island are near the offshore areas where dredging for portions of the proposed vessel approach channel would occur. Additionally, dredged material from construction of the turning basins and channels and future maintenance dredging would be placed on Wallops Island beaches for renourishment to increase shoreline resiliency and shorebird habitat in conjunction with the ongoing SERP.

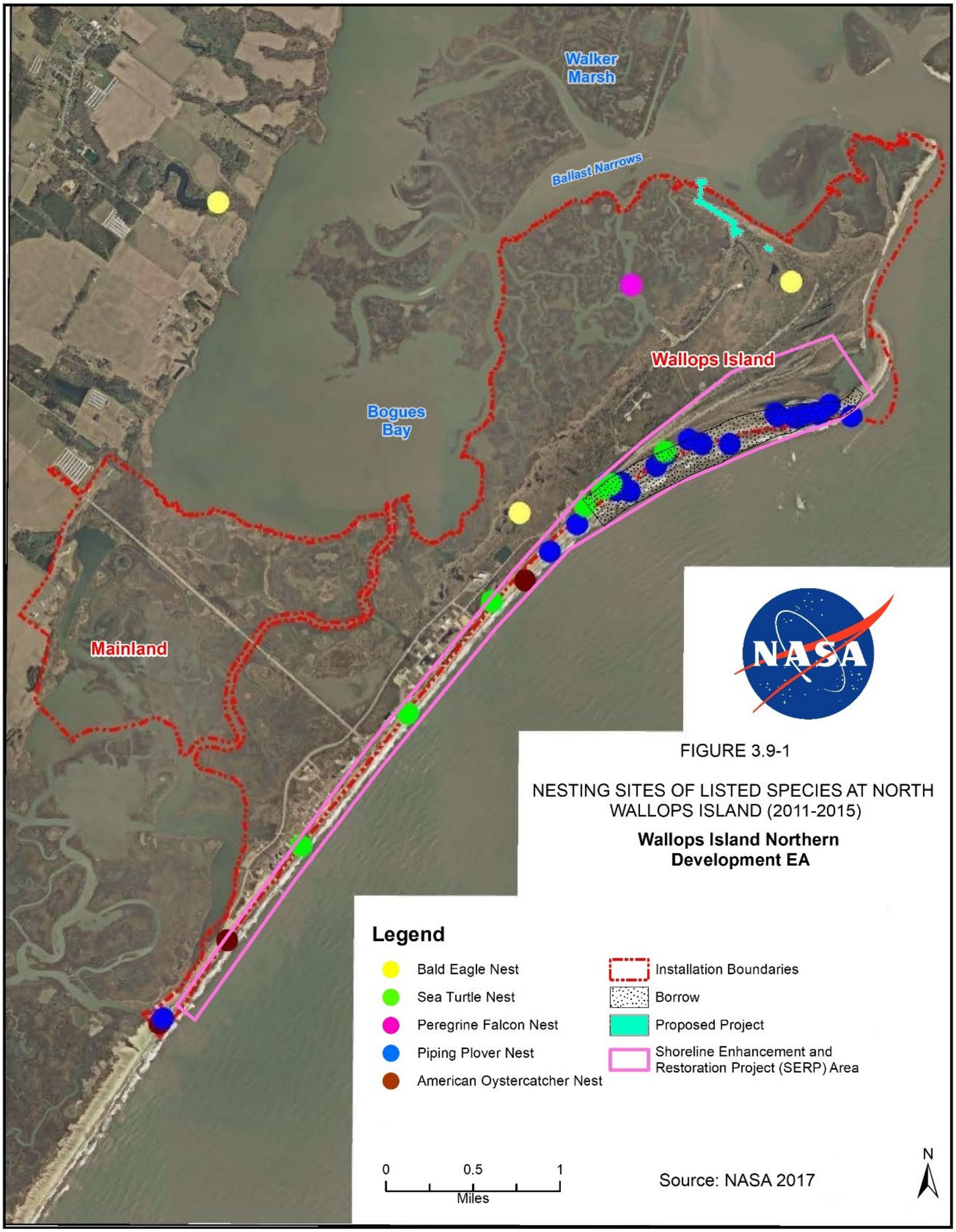

Figure 3.9-1. Special-Status Species at WFF Wallops Island and Mainland (2011-2015)

Piping Plover

The piping plover (*Charadrius melodus*) is federally and state listed as threatened. Nesting habitat generally occurs in areas with little or no vegetation, including coastal beaches above the high tide line, sandflats at the end of spits and barrier islands, gently sloping foredunes, blowout areas behind dunes, and overwash areas between dunes. Nests have also occasionally been found under beach grass and other vegetation (NASA 2015a).

Piping plovers are a transient and summer resident of the upper Virginia barrier islands and are known to inhabit the coastal habitats of Wallops Island and the nearby Chincoteague NWR. Piping plover nests have been documented on coastal beaches along the northeastern side of Wallops Island (**Figure 3.9-1**). Suitable habitat for the species is not present in areas where onshore components of the Proposed Action would be implemented. However, narrow beaches are present along the eastern side of the island adjacent to offshore areas where dredging for portions of the proposed vessel approach channel would occur. Additionally, dredged material from construction of the turning basins and channels and future maintenance dredging would be placed on Wallops Island beaches for renourishment to increase shoreline resiliency and shorebird habitat in conjunction with the ongoing SERP.

Peregrine Falcon

The peregrine falcon (*Falco peregrinus*) is state listed in Virginia as threatened. It formerly was federally listed but has been de-listed by USFWS as it is now considered recovered. An historically active, human-built, nesting tower for peregrine falcons is located at the northern end of Wallops Island approximately 960 m (3,150 ft) southwest of the UAS Airstrip (**Figure 3.9-1**). Peregrine falcons are also known to occur on Wallops Island during migration (NASA 2017).

Loggerhead Sea Turtle

For management purposes, NOAA Fisheries organizes the loggerhead sea turtle (*Caretta caretta*) population into nine distinct population segments (DPS), four of which are listed as threatened and five that are considered endangered. Loggerheads occurring at or near WFF belong to the Northwest Atlantic DPS, which is federally and state listed as threatened. The species nests on coastal beaches and occasionally on estuarine shorelines generally between late April and early September, with hatching occurring at night between late June and mid-November. Loggerhead sea turtles may stay in Virgina coastal waters into early winter (December - January) if water temperatures remain warm (VDWR 2016, Martin 2022). Major nesting concentrations in the U.S. occur from North Carolina to southwest Florida.

Successful loggerhead nests were observed on coastal beaches along Wallops Island as recently as 2013, but no nesting activity by loggerheads, or any other sea turtle species, has been observed on Wallops Island since then (NASA 2021). The closest nest to the Project Area was approximately 2.1 km (1.3 mi) south of the UAS Airstrip. Suitable loggerhead nesting habitat is not present in onshore areas where construction of the Proposed Action would be implemented. However, narrow beaches are present along the eastern side of the island adjacent to offshore areas where dredging for portions of the proposed vessel approach channel would occur. Additionally, dredged material from construction of the turning basins and channels and future maintenance dredging would be placed on Wallops Island beaches for renourishment to increase shoreline resiliency and shorebird habitat in conjunction with the ongoing SERP.

Leatherback Sea Turtle

The leatherback sea turtle (*Dermochelys coriacea*) is federally and state listed as endangered. It is the largest sea turtle and largest reptile species, reaching up to 2 m (6.5 ft) in length and weighing up to 900 kg (2,000 lbs). Leatherbacks are commonly known as oceanic creatures, but they also forage in coastal waters. They are the most migratory and wide-ranging of all sea turtle species. Nesting typically occurs on tropical and subtropical beaches.

Leatherbacks have never been sighted at WFF but are known to occur in the waters offshore of Accomack County (NASA 2017). Leatherback sea turtles may stay in Virgina coastal waters into early winter (December - January) if water temperatures remain warm (VDWR 2016, Martin 2022).

Hawksbill Sea Turtle

The hawksbill sea turtle (*Eretmochelys imbricata*) is federally and state listed as endangered. It can reach up to 1 m (3 ft) in length and weigh up to 80 kg (180 lbs). Hawksbills typically nest high up on tropical beaches under beach and dune vegetation. Females return to natal beaches to lay their eggs every 2 to 3 years. In the continental U.S., hawksbills are found primarily in Florida and Texas, but have been observed as far north as Massachusetts.

Hawksbills have never been observed at WFF (NASA 2017). They may occur in offshore waters, but their preferred tropical habitat is not present at or near WFF.

Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle (*Lepidochelys kempii*) is federally and state listed as endangered. They are the smallest of all sea turtles, growing to 71 cm (28 in) long and weighing up to 45 kg (100 lbs). The species' range includes the Atlantic coastline from Maine to Florida, and the Gulf of Mexico. They are commonly present in areas that have muddy or sandy bottoms. Most Kemp's ridley sea turtle nesting occurs between May and July in the Mexican state of Tamaulipas along the Gulf of Mexico's western shoreline. Occasional nests have also been documented in North Carolina, South Carolina, and Florida. A successful nest was documented in Virginia Beach in 2012 and at an undisclosed location in Virginia in 2021 (Argo 2021).

The Kemp's ridley sea turtle has never been directly observed at WFF but may occur offshore in shallow waters with depths less than 50 m (160 ft) (NOAA Fisheries 2016). Kemp's ridley sea turtles may stay in Virgina coastal waters into early winter (December – January) if water temperatures remain warm (VDWR 2016, Martin 2022).

Green Sea Turtle

The green sea turtle (*Chelonia mydas*) is federally and state listed as threatened. This species is the largest of all the hard-shelled marine turtles, growing to a length of 1 m (3 ft) and weighing up to 160 kg (350 lbs). Nesting generally occurs between June and July along Florida's central and southern coasts. The species is globally distributed and generally occurs in tropical and subtropical waters along continental coasts and islands (NOAA Fisheries 2016).

Green sea turtles have not been observed at WFF but have been discovered in waters off WFF in which they are likely to inhabit during the warmer months when sea grasses and algae are plentiful (NASA 2017). Green sea turtles may stay in Virgina coastal waters into early winter (December - January) if water temperatures remain warm (VDWR 2016, Martin 2022). Green sea turtles have begun nesting regularly in Virginia, and one nested in Virginia in 2021 at an undisclosed location (Argo 2021). None have been found nesting near the Project Area.

Atlantic Sturgeon

The Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) is federally and state listed as endangered. It is a long-lived, estuarine-dependent, anadromous fish that can grow to approximately 4 m (14 ft) in length and weigh up to 360 kg (800 lbs). The species ranges from Newfoundland to the Gulf of Mexico and is highly migratory. Adults migrate to natal rivers and spawn in flowing fresh waters between the salt front and fall line in spring and early summer, then migrate to estuarine and marine waters where they spend the majority of their lives. Atlantic sturgeon typically forage on the bottom for benthic invertebrates (e.g., crustaceans, worms, mollusks). Atlantic sturgeon are known to occur and have been documented in the deeper waters off WFF (NASA 2019). There are no known spawning areas (freshwater rivers) or congregation areas (e.g., mouths of Chesapeake and Delaware Bays) within the vicinity of the action area, so it is expected that any individuals present would be opportunistically foraging during migration. There are five DPSs of Atlantic sturgeon listed as threatened or endangered. The marine range of all five DPSs extends along the Atlantic coast from Canada to Cape Canaveral, Florida. The New York Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs of the Atlantic sturgeon are endangered; the Gulf of Maine DPS is threatened. Transient adult and subadult Atlantic sturgeon originating from any of these DPSs could occur in the action area to opportunistically forage.

Although the Atlantic sturgeon could occur at any time of the year, its likelihood of being present is greatest during fall and early spring during peak migration periods. The shallow estuary where the proposed action would occur provides minimal habitat for the Atlantic sturgeon, and its potential to occur there is likely limited to occasional transient subadults or adults. Spawning adults, eggs, and larvae are not expected to be present.

Giant Manta Ray

The giant manta ray (*Manta birostis*) is federally listed as threatened. It is the world's largest ray with a wingspan of up to 8.8 m (29 ft). The giant manta ray is found worldwide in tropical, subtropical, and temperate bodies of water and is typically found offshore in oceanic waters and near productive coastlines. The species has also been observed in estuarine waters, oceanic inlets, and bays. Off the East Coast of the U.S., giant manta rays occur in water with temperatures ranging from 19 to 22 degrees Celsius (66 to 72 degrees Fahrenheit). The giant manta ray is migratory and solitary, with small, highly fragmented populations that are sparsely distributed around the world. Information on global distribution and population sizes is lacking, but regional populations are small, ranging from 100 to 1,500 individuals. The giant manta ray feeds primarily on planktonic invertebrates but may also consume small fish (NOAA Fisheries 2021a).

The giant manta ray has been observed off the coast of Assateague Island (Swann 2018), and it potentially could occur in the Project Area. However, given its rarity, its solitary and migratory behavior, and the lack of optimal habitat or food sources in the Project Area, the giant manta ray is extremely unlikely to occur in this area. The NOAA Fisheries Section 7 online mapping application (the ESA Section 7 Mapper) did not identify the giant manta ray as potentially occurring in the Project Area (NOAA Fisheries 2020e).

3.9.1.2 *Bald Eagle*

The bald eagle (*Haliaeetus leucocephalus*) is protected under the BGEPA. It formerly was federally listed but has been de-listed by USFWS as it is now considered recovered. In accordance with National Bald Eagle Management Guidelines (USFWS 2007), NASA maintains a 200 m (660 ft) buffer around bald eagle nest sites, and it coordinates with USFWS to determine if mitigation measures are adequate. Two bald eagle nests have been recorded on the northern end of Wallops Island, one located approximately 305 m (1,000 ft) southeast of the UAS Airstrip and the other approximately 3.4 km (2.1 mi) southwest of the airstrip (**Figure 3.9-1**). Both nests were last occupied in 2016 (Center for Conservation Biology 2022). NASA holds USFWS Migratory Bird Permit Number MB50674C-0 for Purposeful Eagle Take for Safety/Eagle Nest Take. The permit authorizes harassment of adult bald eagles and removal of nests constructed within 1.6 km (1.0 mi) of the southeast end of the UAS Airstrip, if no eggs or chicks are present. In accordance with this permit, NASA and MARS annually report on results of required monitoring for active eagle nests. Monitoring and reporting would continue in the Project Area and allowed take would occur only as necessary for safety. Otherwise, bald eagle nests would be protected by buffers. Therefore, the bald eagle is not addressed further in this EA.

3.9.1.3 *Migratory Birds*

As discussed in Section 3.7.1.1, most bird species in the Project Area are protected by the MBTA. (federally and state listed birds, which are also protected under the MBTA, are discussed above.) The MBTA is the primary legislation in the U.S. established to conserve migratory birds. The MBTA prohibits the intentional taking, killing, or possessing of migratory birds unless permitted by regulation. EO 13186 (66 Federal Register 3853–3856), *Responsibilities of Federal Agencies to Protect Birds*, provides a specific framework for federal agencies to comply with their MBTA obligations and aids in incorporating bird conservation planning into agency programs. For the purposes of the MBTA and EO 13186, migratory birds have been defined to include all native birds in the U.S., except certain non-migratory game species managed by the states (e.g., quail, turkey, grouse, and ptarmigan). The Project Area includes habitats that are used by a variety of birds protected under the MBTA.

3.9.1.4 *Marine Mammals*

Marine mammals are protected under the MMPA. The discussion of marine mammals in this EA is limited to one species each of dolphins and porpoises, and two species of seals that would have the potential to occur transiently in near-shore and inshore waters where in-water activities associated with the Proposed Action would take place. Large marine mammals, such as whales, primarily inhabit offshore waters. They would be very unlikely to occur in the relatively shallow waters where the Proposed Action would be implemented, and they were not identified by NOAA Fisheries as potentially occurring in the Project Area (NOAA Fisheries 2020f). Therefore, these species are not addressed in this EA. Marine mammals known or with the potential to occur in inshore and nearshore waters adjacent to and near NASA WFF are the bottlenose dolphin, harbor porpoise, harbor seal, and gray seal (NOAA Fisheries 2020f). These species are discussed below.

Bottlenose Dolphin

The bottlenose dolphin (*Tursiops truncatus*) occurs worldwide in temperate and tropical waters. Individuals range up to 3.8 m (12.5 ft) long and can weigh between 136 and 635 kg (300 and 1,400 lbs). Inshore bottlenose dolphins are smaller and lighter in color and are commonly found in groups of 2-15 individuals. Coastal populations migrate into bays, estuaries, and river mouths and generally feed on benthic invertebrates and fish. In the lower portion of Chesapeake Bay, bottlenose dolphins are observed nearly year-round. In the warmer months, they commonly forage throughout the bay and its tributaries. Bottlenose dolphins occur in Virginia waters throughout the year; however, their presence increases substantially in spring and summer months. Significant bottlenose dolphin presence in the coastal waters of Virginia and Chesapeake Bay typically begins in April or May and appears to be strongly correlated with water temperatures. Southward migration typically begins in August or September, with dolphin presence significantly reduced by October or November (Costidis et al. 2017).

Harbor Porpoise

The harbor porpoise (*Phocoena phocoena*) is the only member of the porpoise family seasonally endemic to the waters of Virginia. The harbor porpoise is a small (0.4 to 1.9 m [1.3 to 6.2 ft] in length), stocky, toothed whale with spade-shaped teeth that distinguish it from dolphins. Stranded harbor porpoises recorded in Virginia over the last 25 years have not exceeded 1.7 m (5.5 ft) in length. Almost half of the individuals with an accurate length were immature and 1.1 to 1.2 m (3.6 to 3.9 ft) in length. A study of stranded harbor porpoises in Virginia and northern North Carolina identified anchovy and hake as the most important prey, with Atlantic herring, Atlantic menhaden, longfin squid, and shrimp also common in the diet (Costidis et al. 2017).

Harbor porpoises can be found from shallow coastal waters to deep offshore waters, with highest densities over the continental shelf. In summer months, harbor porpoise distribution tends to be focused in more northern waters of the Atlantic in the U.S. and Canada. In winter months, harbor porpoises disperse more widely and can be encountered in the waters off Virginia in intermediate densities. The harbor porpoise is the second most common marine mammal to strand in Virginia after the bottlenose dolphin. Since 1988, there have been an average of 11 strandings per year. The strandings are highly seasonal, occurring almost exclusively from February through May. Strandings are concentrated on the ocean-facing beaches of Virginia Beach, but also occur regularly on the ocean-facing beaches along Virginia's Eastern Shore and in the lower Chesapeake Bay (Costidis et al. 2017).

Harbor Seal

Harbor seals (*Phoca vitulina*) range from 1.7 to 1.9 m (5.6 to 6.3 ft) in length, weigh up to 110 kg (245 lbs), and eat a variety of prey, including fish, cephalopods, and crustaceans. Harbor seals use rocks, reefs, and beaches as haul-out sites for rest, thermal regulation, social interaction, and pupping. Harbor seals are relatively small seals that exhibit little to no apparent sexual dimorphism. Harbor seals in Virginia are considered part of the Western North Atlantic population. Harbor seals are a coastal species present throughout the north and mid-Atlantic. Harbor seal presence in Virginia waters is seasonal, with sightings usually beginning in winter (January-February) and extending into spring (April-May) (Costidis et al. 2017).

Sightings of harbor seals in Virginia include adults and juveniles, but strandings have been primarily juveniles. Harbor seals have consistently stranded in Virginia since 1991, but as larger, healthier individuals have established haul-outs in the region, the number of strandings has declined. Increased harbor seal presence in Virginia is suggested by anecdotal sightings, survey data, and stranding records. Survey data from the last few years show several locations that have consistent seasonal usage as haul-out sites. Individuals have been re-sighted at the same haul-out locations from year to year, suggesting a certain degree of site fidelity. Generally, the haul-outs appear to be used primarily by adult-sized individuals, whereas singly hauled-out animals along Virginia's coast are usually yearlings. Stranding records show distinct seasonality, with winter and spring months having the highest stranding numbers (Costidis et al. 2017). NASA has documented sporadic haul-outs of harbor seals on the Wallops Island shoreline.

Gray Seal

Gray seals (*Halichoerus grypus*) exhibit substantial sexual dimorphism, with males growing up to 2.3 m (7.5 ft) in length and weighing up to 310 kg (685 lbs), and females averaging 2.0 m (6.5 ft) in length and weighing up to 185 kg (410 lbs). Gray seals eat a variety of prey, including fish, cephalopods, and mollusks. Gray seals breed in Canada, and those in Virginia waters are a mixture of adult and weanling individuals. Their presence in Virginia waters is sporadic, occurring in winter and early spring; however, observations appear to be increasing. Gray seals were not regularly observed in Virginia until 2003. Since then, one to two per year have been observed, with a high of four in 2015. Strandings have occurred almost exclusively from March to May, with 75 percent of the 15 strandings thought to be yearlings (Costidis et al. 2017). NASA has documented sporadic haul-outs of gray seals on the Wallops Island shoreline.

3.9.2 Environmental Consequences

Evaluation of potential impacts on special status species is based on the sensitivity of the species to the proposed activities and the amount of habitat that would be temporarily or permanently affected. Impacts on special status species would be considered significant if they are likely to result in reductions in populations or the distribution of the species.

3.9.2.1 No Action Alternative

The No Action Alternative would have no impacts on special-status species because construction and operation of the proposed MARS Port would not be implemented. Special-status and protected species occurring at NASA WFF would continue to be managed as they are currently.

3.9.2.2 Proposed Action: Phases 1, 2, and 3

3.9.2.2.1 Federal or State ESA Listed Species

The effects of the Proposed Action on federal listed species are evaluated in detail in the letters submitted to USFWS and NOAA Fisheries on December 13, 2022, as part of the informal consultation process in accordance with ESA Section 7. Those letters are provided in **Appendix E**. The effects of the Proposed Action on listed species are also discussed below. The terrestrial species are discussed in two main groups: terrestrial species that are under USFWS jurisdiction and have a state listing status, and terrestrial species that have a state status only. The aquatic species are under NOAA Fisheries jurisdiction. The marine mammals that potentially occur in the Project Area are not ESA listed species and are discussed in a later section.

The detailed discussion below of potential effects on listed species includes Proposed Action activities other than the placement of dredged material, which is discussed here. As described in Section 2.3.2, the option selected for the placement of dredged material from construction dredging and long-term maintenance dredging is the pumping of the material from transport barges onto the beach in the SERP area. The elements of the ongoing project to protect Wallops Island shoreline infrastructure through beach renourishment are described in detail in the *SERP EA* (NASA 2019c).

The listed species potentially affected by dredged material placement on beaches in the SERP area are the piping plover, red knot, and loggerhead sea turtle (when nesting). In a 2019 BO (USFWS 2019), USFWS determined that the renourishment activities proposed as part of the SERP are likely to adversely affect the piping plover, red knot, and loggerhead sea turtle. USFWS determined that the SERP is not likely to adversely affect the roseate tern, hawksbill sea turtle, leatherback sea turtle, Kemp's ridley sea turtle, green sea turtle, or seabeach amaranth.

The 2019 BO included an Incidental Take Statement and required the implementation of measures, terms, and conditions to minimize impacts to the piping plover, red knot, and loggerhead sea turtle.

Measures listed in the *SERP EA* (NASA 2019c) that would also be applicable for the Proposed Action include the following:

- Dredged material placement will not begin until after the last plover chick has fledged or the last loggerhead has hatched, whichever is later.
- Preparation and distribution of a fact sheet containing this information to all project personnel.
- Minimization of foot traffic during construction.
- Inspection of all vehicles for leaks immediately prior to work in beach habitat.
- Notification to the USFWS regarding the projected and actual start dates, progress, and completion of the project and verify that the beach habitat alteration was not exceeded and all conservation measures were followed.
- Submission of an annual report summarizing the survey and monitoring efforts, location and status of all occurrences of listed species recorded, and any additional relevant information to the USFWS by December 31 of each year.

In addition, the VMRC permit for the SERP also prescribes six terms and conditions to reduce impacts to special status species, as detailed below.

- Activities shall not begin until the last piping plover or American oystercatcher chicks have fledged or the last loggerhead sea turtle nest has hatched or been deemed nonviable by VDWR staff, whichever is later.
- Every effort shall be made to complete activities by March 15 of any year. If work must continue past the March 15 deadline, daily monitoring for red knot migrants and nesting piping plovers and American oystercatchers shall begin on March 15 and continue until the last chicks of either species fledges. Daily sea turtle nest patrols shall begin on May 1, and continue until the last nest hatches or is deemed nonviable by VDWR staff.
- If a piping plover or sea turtle nest is found before renourishment activities are completed, all activities must cease until the WFF staff has notified the USFWS and VDWR and VDWR has completed an on-site determination about whether or not construction activities may continue.
- If an American oystercatcher nest is found before renourishment activities are completed, all activities must cease until the VDWR staff has completed an on-site determination about whether or not construction activities may continue.
- Predator screens will be placed over sea turtle nests and predator exclosures shall be erected around all piping plover nests.
- Equipment and materials shall be staged in upland areas westward of the beach and outside of sensitive habitats (e.g., marshes, mudflats, dunes).

The dredged material from maintenance of the turning basin and channels under the Proposed Action would be used by the SERP in conjunction with material from other sources for beach renourishment in the SERP area. Potential adverse effects from this activity on federally listed species, evaluated by USFWS and National Marine Fisheries Service (NMFS) in BOs for the SERP (USFWS 2019, NMFS 2012), would be minimized by implementing the above measures, terms, and conditions previously stipulated by the USFWS and VMRC for the beach renourishment activity. In order to avoid adverse impacts to nesting shorebirds, MARS and NASA would observe a time-of-year restriction from March 15 to August 31 for beach placement of dredge material from Phase 1 of this Proposed Action. If a sea turtle nest is discovered, this time-of-year restriction would be extended to November 30. Every effort would be made to coordinate Phase 2 and Phase 3 dredging operations with ongoing WFF shoreline renourishment actions; however, the ability to do so would be contingent on the availability of funding for each phase of the proposed project (see Section 4.2). Therefore, potential effects from the placement of dredged sand on the beach are not further evaluated in detail below.

Terrestrial Species – USFWS Jurisdiction and State Status

Bats

In the short term, construction of the Proposed Action would have the potential to disturb two listed bat species (northern long-eared bat, tricolored bat) if present in or near the Project Area. These bat species would be impacted by the removal of trees during onshore construction activities.

The removal of mature trees under the Proposed Action would be minimized to the extent possible and limited to those necessary to complete the proposed facility. NASA and VCSFA would comply with procedures documented in the 2019 BO for the northern long-eared bat and would follow new time-of-year tree clearing restrictions from April 1 to November 14. Maternity roost trees would not be removed, should any be identified (see Section 4.2). Therefore, NASA anticipates the these bat species would not be adversely affected by the Proposed Action.

Birds

In the short term, construction of the Proposed Action would have the potential to disturb three listed bird species (rufa red knot, piping plover, eastern black rail) if present in or near the Project Area. Birds could be affected by noise, increased human presence, or removal of vegetation potentially providing habitat. The Proposed Action is unlikely to affect the red knot or piping plover because these species occur on beaches, and project activities would not occur in beach areas potentially providing suitable habitat for these species.

The eastern black rail potentially inhabits the salt marsh where the proposed pier would be installed. A survey of suitable habitat in the Project Area during breeding season in June 2021 did not detect the presence of eastern black rails (CEC 2021). The area of potential habitat that would be affected would be very small compared to the extensive marsh habitat in adjacent areas. In addition, NASA has agreed through consultation with USFWS to implement practices during construction that would avoid or minimize impacts on the eastern black rail (see Section 4.2). These practices include adherence to construction techniques such as vibratory dampening and the use of lighting methods that would minimize potential effects on the eastern black rail. *Phragmites* potentially could invade areas disturbed during construction and further reduce available habitat. NASA and VCSFA would ensure implementation of the 2014 *Phragmites Control Plan* to limit the spread of this invasive species.

Open-water construction activities (i.e., dredging of channels and turning basins and construction of the outer portion of the pier) would have no or minimal direct impacts on listed birds because onshore habitat near these activities, including nesting habitat, is absent or minimal. Also, adult birds are highly mobile and could avoid these areas during project activities. Since the dredged material has been determined to be compatible with the current shoreline sand, the material would be placed along the seawall to protect the beach from tidal impacts or ocean overwash from coastal storms. This could bury potential prey for the piping plover and rufa red knot and, thus, have short-term impacts on their ability to forage in this area of the beach. However, long-term effects could be beneficial as the amount of beach habitat would be slightly expanded and protected (NASA 2010b, NASA 2018).

Airborne noise can be roughly estimated by assuming the construction equipment required and providing a distance to a noise sensitive receptor. For the future replacement of the causeway bridge at the west side of Wallops Island, the noise from piling driving was estimated at 101 dBA at 15.25 m (50 ft) (NASA 2019a). In its Programmatic Biological Opinion on the SRIPP (NASA 2010a), USFWS set protected species monitoring requirements at the 100 dB contours from a rocket launch (NASA 2019a). Habitat potentially suitable for use by the eastern black rail occurs adjacent to the pile driving location and within the 100 dB noise contour. Consequently, eastern black rails if present in this habitat would be disturbed by noise during pile driving and would be expected to avoid the area and move into surrounding habitats during construction. The nearest recorded piping plover nesting location and rufa red knot foraging location would be greater than 2,130 m (7,000 ft) from pile-driving activities under the Proposed Action; thus, no airborne noise impacts are anticipated to these two species.

Activities associated with the operation of the proposed port would be like other commercial boating activities occurring with relative frequency in and around the Project Area. Birds in the area are likely to be habituated to current boating activities, as well as aircraft operations at the UAS Airstrip, and operational activities of the proposed port would not be particularly unusual or disruptive to listed birds. Birds may leave the immediate area during these operational activities but would be expected to return upon completion of project activities. Overall, the areas of potential habitat that would be temporarily disturbed by the Proposed Action would be small relative to the available, surrounding habitat.

For these reasons, effects of the Proposed Action on the rufa red knot, piping plover, and eastern black rail would be insignificant or extremely unlikely (discountable). Accordingly, the Proposed

Action may affect but is not likely to adversely affect these three bird species, and its impacts on these species would be less than significant.

Sea Turtles on Land

Sea turtles are under USFWS jurisdiction only when they come ashore for nesting, including eggs and hatchlings before they enter the water. When onshore for nesting, sea turtles (including their eggs and hatchlings) would not be affected by construction activities due to the lack of beach habitat and nesting sites within the Project Area. Loggerhead sea turtle nesting was last observed on Wallops Island beaches in 2013. The proposed placement of dredged material would be within the SERP area on northern Wallops Island. The USFWS BO for the SERP (USFWS 2019) addressed the potential impacts from sand renourishment activities on nesting loggerhead sea turtles. All terms and conditions of the BO listed above would be followed and would minimize potential effects (see Section 4.2).

No nesting activity by any other sea turtle species has been observed on Wallops Island (NASA 2021). One leatherback sea turtle was observed demonstrating nesting behavior on Assateague Island in 1996. The hawksbill sea turtle has been observed in Virginia only twice since 1979 (Mansfield 2006). Kemp's ridley and green sea turtles have been found to nest at Virginia Beach and other undisclosed locations in Virginia (Argo 2021), but none have been found nesting on WFF. Due to the lack of nesting actvities by these species in the Project Area, the proposed action would have no effect on nesting sea turtles.

Terrestrial Species – State Status Only

Four species of birds included in **Table 3.9-1** for evaluation of their potential to occur in the Project Area have a state listing status but no federal status: the peregrine falcon, loggerhead shrike, Wilson's plover, and gull-billed tern. As noted in the table, other than the peregrine falcon, these species have not been documented at NASA WFF and are unlikely to be present in the Project Area or be affected by the Proposed Action. Therefore, the Proposed Action would have no effect on the loggerhead shrike, Wilson's plover, and gull-billed tern.

The peregrine falcon has been observed at NASA WFF and near the Project Area. Construction activities associated with the Proposed Action would be unlikely to disturb or otherwise adversely affect the state-listed peregrine falcons that nest on or near the northern end of Wallops Island. One peregrine falcon nesting tower installed on the west side of north Wallops Island has been historically used by a pair of falcons. The tower is approximately 0.9 km (0.6 mi) southwest of the Proposed Action area. Given that the nesting tower is located similar distances from existing roadways and other active facilities, the falcons are expected to be habituated to human activity in these areas and unlikely to be disturbed by project-related activities.

Aquatic Species – NOAA Fisheries Jurisdiction

In the short term, construction of the proposed MARS Port and associated increases in turbidity, underwater noise, and vessel traffic would have the potential to adversely affect individuals of aquatic listed species under NOAA Fisheries jurisdiction (i.e., sea turtles in the water, Atlantic sturgeon, and giant manta ray). In-water construction activities involving disturbance of the subaqueous bottom, such as pier construction (including pile driving), vessel and barge anchoring, and dredging of the turning basins and access channels, would also have the potential to inadvertently destroy or displace benthic organisms that provide a food source for some of the listed species. These activities would disturb sediments, which would temporarily increase turbidity, decrease visibility and light penetration, and interfere with respiration by fish and invertebrates. The inadvertent destruction or displacement of benthic organisms would be localized and would not substantially affect the quantity of benthic prey available in waters near the Project Area. Maintenance dredging of the basin and channel would be repeated periodically as necessary to maintain the required depth and is expected to be infrequent and of short duration. The effects of such stressors resulting from the Proposed Action are discussed below for these listed species under NOAA Fisheries jurisdiction.

Sea Turtles in Water

Sea turtles potentially occur in the waters of the Project Area mainly during the seven months of the year when water temperatures are warmest (May through November). Turtles may stay through early winter (December - January) if water temperatures remain warm (VDWR 2016, Martin 2022). Activities occurring in the other months would have no effect on in-water sea turtles.

Turbidity

Pile driving for pier construction, channel and turning basin dredging, and placement of dredged sediment would cause temporary increases in suspended sediment, thereby increasing local turbidity. The locations and quantities of sediment disturbance would be distributed throughout the implementation period of the Proposed Action, and disturbed sediments would be expected to quickly resettle near their original location in the relatively shallow waters of the Project Area.

During pier construction, the installation of piles would disturb bottom sediments, which may temporarily increase suspended sediment in the action area. Information collected from a project in the Hudson River indicates that pile driving activities may produce total suspended sediment (TSS) concentrations of approximately 5 to 10 milligrams per liter (mg/L) above background levels within approximately 91 m (300 ft) of the pile being driven. The resulting sediment plume is expected to be small and to settle out of the water column within a few hours (NOAA Fisheries 2020).

During channel and turning basin dredging, sediment disturbance and TSS concentrations can vary greatly depending on factors such as the equipment used, currents, and tides. As discussed in Section 3.5.1.2, the primary physical impact from mechanical dredging involves a re-suspension of sediments and increased turbidity that could adversely affect marine life and water quality. Proposed dredging operations would likely cause sediment to be suspended in the water column. Maximum concentrations of suspended solids would occur in the immediate vicinity of the dredging areas and decrease rapidly with distance from the operation due to settling and dilution of the material. Studies of past similar projects found that the extent of the sediment plume is normally limited to between 490 m (1,600 ft) and 1,200 m (4,000 ft) from the dredge operation and that elevated turbidity levels are usually short-term, approximately an hour or less (NASA 2013). Another study (Bohlen et al. 1979) found that sediment concentrations along the centerline of a dredge-induced plume decreased rapidly to background levels within 700 m (2,300 ft), and that the total suspended load in an estuarine system after a storm event was an order of magnitude greater than that produced by dredging activities (e.g., bucket load leakage, dredge-induced plume). Therefore, the turbidity generated by sediment dredged from the vessel access channel and turning basin would have a short suspension time during dredging, transport, and disposal or reuse of the material in the dredged material placement site.

In addition, turbidity control measures, such as turbidity curtains (also referred to as sediment curtains), could be implemented to prevent suspended sediments from exceeding water quality standards, and frequent monitoring during construction could be performed to ensure the effectiveness of suspended sediment containment (see Section 4.2). Turbidity curtains are designed to contain or deflect suspended sediments or turbidity in the water column and, when properly deployed and maintained, can effectively control the flow of turbid water. Sediment containment within a limited area is intended to provide time for particles to settle out of suspension and reduce their transport to other areas where negative impacts could occur. Suspended solids can also conceivably be diverted from areas where environmental damages could occur from the settlement of these suspended particles. The use of turbidity curtains around the pier construction area and the basin and access channel dredging areas would reduce or eliminate the potential impacts from sediments that may be released at the point of construction.

The areas of estuarine habitat that would be affected by turbidity from the Proposed Action would be minimal in comparison to the extensive surrounding areas of potential sea turtle habitat. No information is available on the effects of TSS on juvenile and adult sea turtles. Effects of turbidity on individual sea turtles that may occur in the Project Area would be of short duration. Sea turtles breathe air and would not be adversely affected by passing through the temporary turbidity plume. Sea turtles also would be able to swim away from the turbidity plume. Turbidity would be most likely to affect sea turtles if a plume caused a barrier to normal behaviors, although sea turtles would be expected to swim through the plume with no adverse effects. While the increase in suspended sediments may cause sea turtles to alter their normal movements, these minor alterations would be too small to be meaningfully measured or detected. TSS is most likely to affect sea turtles if a plume causes a barrier to normal behaviors. However, sea turtles would be expected to swim through the plume to avoid the area with no adverse effects.Thus, the increase in turbidity may cause sea turtles to alter their normal movements, but these minor changes would be too small to be meaningfully detected or measured (NOAA Fisheries 2020b). For these reasons, physical and behavioral turbidity effects on sea turtles would be too small to be meaningfully measured or detected, and would be less than significant (Hopper 2021).

Entrainment during Dredging

Entrainment in dragheads during dredging is the primary risk regarding incidental take of sea turtles. Entrainment is believed to occur primarily as the dredge is being placed or removed from the bottom, creating suction in the draghead and it is likely that only those turtles resting or feeding on or near the bottom would be vulnerable to entrainment. The risk appears to be highest when bottom terrain is uneven or when the dredge is conducting “clean up” operations at the end of a dredge cycle. In these instances, the draghead is often not buried in the sand, making sea turtles near the bottom more vulnerable (NASA 2010b).

The number of interactions between dredge equipment and sea turtles seems to be best associated with the volume of material removed, which is related to the length of time dredging takes. A greater number of interactions are associated with a greater volume of material removed and a longer duration of dredging. The number of interactions is also influenced by the time of year dredging occurs, with more interactions recorded during the summer months. Interactions are also more likely at times and in areas when sea turtle forage items are concentrated in the area being dredged, as sea turtles would be more likely to spend time on the bottom while foraging. Few interactions with listed species have been recorded during dredging in the vicinity of the Project Area. This is partially due to the infrequency of dredging and partially due to the transitory occurrence of most sea turtles in the area (NASA 2010b).

During consultation on the NASA SRIPP in 2010, NOAA Fisheries stated in its BO (NASA 2010b) that, based on the distribution of sea turtles in the Project Area and the historic interactions between sea turtles and dredging and relocation trawling operations, it was reasonable to expect that one sea turtle would likely to be injured or killed for approximately every 1,150,000 m^3 (1,500,000 yd^3) of material removed from proposed borrow areas. NOAA Fisheries also anticipated that 90 percent of interactions would occur with loggerhead sea turtles (NASA 2010b). Based on that assessment, NASA anticipates that no sea turtles are likely to be entrained in any dredge cycle given that a maximum of approximately 42,500 m^3 (55,600 yd^3) of material would be removed, which would be much less than evaluated in the BO.

Given the limited number of sea turtles expected to use the proposed turning basin and channel as habitat and the limited portion of available habitat that would be affected, the potential for interaction is limited. Additionally, this conclusion is supported by WFF’s two dredge and pump beach fill cycles, conducted during the months of April and August. Protected species observers stationed onboard each of the three dredges evaluated every load and did not document a sea turtle entrainment during either dredging event (NASA 2013). Sea turtles are not known to be vulnerable to entrainment in mechanical dredges, presumably because they are able to avoid the dredge bucket. Thus, if a sea turtle were to be present at the dredge site, it would be extremely unlikely to be injured or killed as a result of dredging operations carried out by a mechanical dredge (Hopper 2021).

Based on the mobility of sea turtles, the transitory occurrence of sea turtles in the dredging area, the infrequency of dredging, and the extremely low likelihood of a sea turtle being entrained by a mechanical dredge, impacts on sea turtles from entrainment during dredging would be less than significant.

Vessel Strikes

Where there is overlap between vessel traffic and sea turtle habitat, there is the possibility of vessel strikes to sea turtles, which potentially can result in injury or mortality. The dredging of new channels and turning basins as part of the Proposed Action would increase vessel traffic in the area during dredging operations. Any increases in vessel traffic may not directly correlate to more vessels in the Project Area, as active vessels in the area may move elsewhere or be retired from use. During dredging and placement of dredged material, only one or two project vessels would likely be utilized, and the use of dredging vessels would be intermittent (every 3-5 years), temporary, and restricted to a small portion of the overall Project Area on any day that dredging occurs.

In accordance with NOAA Fisheries recommendations, vessels involved in pile driving, construction, dredging, and spoil placement would use trained protected species observers to monitor for sea turtles and other protected species in the area of operations. Monitoring and exclusion zones would be established around the location of activities that could cause injury or disturbance to sea turtles, and operation of moving equipment would cease if a sea turtle is observed within 45 m (150 ft). Construction vessels would travel at a slow, safe speed, and observers would maintain a vigilant watch for sea turtles. Vessels would operate at idle/no wake speeds when in project construction areas, in water depths where the draft of the vessel provides less than 1.2 m (4 ft) of clearance from the bottom, and in all depths after a sea turtle has been observed in or has recently departed the area (see Section 4.2) (NOAA Fisheries 2021b, NOAA Fisheries 2021c).

During the period of operation after dredging of the existing channel and new turning basin is completed, there would be an increase in the baseline number of vessels or changes in vessel traffic patterns due to vessels transiting to the MARS Port pier. However, it would be extremely unlikely for a vessel related to the Proposed Action to strike and injure or kill a sea turtle given the nature of the habitat in the Project Area; the low baseline risk of vessel strikes in the area; and the extremely small, intermittent increase in vessel traffic that the Project would add to existing traffic in the area. Section 2.3.5 and **Table 2-3** iterate the anticipated size and number of each vessel trip on an annual basis. For comparison, according to the USACE Norfolk District about the Chincoteague Inlet Federal Navigation Project, Chicoteague Inlet serves as the entrance from the Atlantic Ocean to the largest commercial port on the Eastern Shore and supports more than 3,000 vessels a year and the project supports all types of commercial fishing and tourism vessels. Also, given that the presence of sea turtles in the Project Area is seasonal and the numbers potentially occurring in the warmer months are small, the risk of vessel strike is extremely low. Additionally, vessels entering the inlet would reduce speed, further reducing the probability of vessel strikes. In accordance with NOAA Fisheries vessel strike avoidance recommendations (NOAA Fisheries 2021c), vessels would operate at idle/no wake speeds when in water depths where the draft of the vessel provides less than 1.2 m (4 ft) of clearance from the bottom, and in all depths after a sea turtle has been observed in or has recently departed the area. As a result, the effect of the Proposed Action on the risk of a vessel strike on sea turtles in the Project Area would be less than significant.

Noise

Sea turtles potentially could be affected by underwater noise produced during construction or operation of the Proposed Action, including noise from pile driving, vessels, and dredging. The NOAA Fisheries GARFO Acoustics Tool (NOAA Fisheries 2020a) was used to evaluate potential underwater noise impacts on sea turtles from pile driving during construction of the Proposed Action. Exposure to impulsive underwater noise levels of 232 dB re 1 µPa (SPL_{peak}) or 204 dB re 1 $\mu Pa^2 s$ (SEL_{cum}) can result in permanent injury to sea turtle hearing, and exposure to lower levels can result in temporary effects. Exposure to an SPL_{peak} that may result in injury to sea turtles is not anticipated to occur during pile driving for the Proposed Action because the SPL_{peak} and the SEL_{cum} at the source (i.e., within 10 m [33 ft] of the pile being driven) would be less than the effects thresholds. Therefore, no noise injury to sea turtles is anticipated. Behavioral effects, such as avoidance of the area or disruption of foraging activities, may occur in sea turtles exposed to noise above the behavioral threshold (SPL_{rms} = 175 dB re 1 µPa). Underwater noise levels are also predicted to be below this threshold at the source. Sea turtles are mobile, would avoid the activity and noise associated with pile driving, and would not remain adjacent to a pile being driven. The waterway at the location where the pier would be constructed is approximately 1.6 km (1 mi) wide, providing extensive habitat in which a sea turtle could avoid the ensonified area. Thus, the effects on sea turtles from noise produced during pile driving for construction of the Proposed Action would be less than significant.

Furthermore, a soft-start procedure would be used for pile driving to allow sea turtles that may be in the Project Area to detect the presence of noise-producing activities and depart the area before full-power, pile-driving activity begins. Soft-start procedures would not begin until the exclusion zone, which would surround the Project Area and be monitored for the presence of sea turtles, has been cleared. A bubble curtain could be used for noise attenuation around each pile being driven (see Section 4.2). Bubble curtain effectiveness can be highly variable depending on local conditions and the type of system used. Given the uncertainty associated with the potential use of bubble curtains for noise attenuation, this evaluation was conservative, and the estimated effects of using a bubble curtain were not included in the modeling of threshold distances. To mitigate any adverse effects on sea turtles, each day during pile driving, or prior to resuming pile driving after a greater than 30-minute pause, a trained observer would perform a visual “sweep” of the waterways adjacent to the pier. If a sea turtle is observed within 460 m (1,500 ft) of the work area, pile driving would be stopped until the turtle has moved outside of the observation area. NASA and VCSFA would direct the construction contractor to install pilings by vibratory techniques rather than hammer methods to reduce the noise and vibration of the pile driving installation (NASA 2009). Given this use of observers and the short distances for effects threshold calculated by the model without the assumption of bubble curtains, the use of bubble curtains for additional noise attenuation would not be warranted.

Sea turtles in the Project Area also may be affected by noise generated by vessels during construction or vessels calling on the pier during its operation. The SPLs produced by larger vessels at 1 meter are less than the sea turtle noise response criteria for injury (226 to 232 dB re 1 µPa), and those for smaller vessels are also less than the sea turtle noise response criterion for behavioral effects (175 dB re 1µ Pa). A sea turtle would need to be near a large vessel such as a supertanker to experience sound levels that exceed the 175 dB re 1µ Pa behavioral effect threshold, and such large vessels would not be associated with the Proposed Action (NOAA Fisheries 2020a).

Noise from dredging vessels and associated equipment and operations was evaluated by NOAA Fisheries in a 2012 BO, which concluded that the effects of dredge noise on whales are discountable (NASA 2018). Whales are generally more sensitive to underwater noise than sea turtles, so effects on sea turtles would be even less likely. The numbers of sea turtles in the Proposed Action area are very low, and it is extremely unlikely for a sea turtle to occur close enough to the dredge to be disturbed by noise. In addition, mitigation measures would be employed using protected species observers, which can halt dredging operations when a sea turtle is observed within a minimum defined distance (e.g., 1 km [3,280 ft]) of the dredge (NASA 2018).

Thus, the overall likelihood of a sea turtle being adversely affected by noise from construction or operation of the Proposed Action would be extremely low, and any potential effects would be less than significant.

Atlantic Sturgeon

The potential for impacts on Atlantic sturgeon would be affected by the seasonal timing of in-water activities. Recent studies of the Atlantic sturgeon have suggested that the shallow waters off the Atlantic coast could be an important migratory corridor to and from spawning, foraging, and overwintering grounds. As there are no known spawning areas (freshwater rivers) or congregation areas (e.g., the mouths of Chesapeake Bay and Delaware Bay) within the project vicinity, it is expected that any individuals encountered would be opportunistically foraging during migration. The potential impact of construction and dredging activities on Atlantic sturgeon would depend on the time of year the activities were conducted, with the likelihood of encountering a sturgeon greatest during fall and early spring, which are times of peak migration (NASA 2019a).

Turbidity

Turbidity effects and control measures, discussed above for sea turtles, are also applicable to Atlantic sturgeon. During pier construction, the installation of piles would disturb bottom sediments, which may temporarily increase suspended sediment in the action area. Information collected from a project in the Hudson River indicates that pile driving activities may produce TSS concentrations of approximately 5 to 10 mg/L above background levels within approximately 91 m (300 ft) of the pile being driven. The resulting sediment plume is expected to be small and to settle out of the water column within a few hours. Studies of the effects of turbid water on fish suggest that toxic effects would not be expected before TSS concentrations reach thousands of mg/L. The TSS levels expected for pile driving (5 to 10 mg/L) are below those shown to have adverse effects on fish (typically up to 1,000 mg/L) and benthic communities (390 mg/L) (NOAA Fisheries 2020b).

During channel and turning basin dredging, sediment disturbance and TSS concentrations can vary greatly depending on factors such as the equipment used, currents, and tides. TSS concentrations associated with mechanical clamshell bucket dredging operations similar to the Proposed Action, have been found to range from 105 mg/L in the middle of the water column to 445 mg/L near the bottom (210 mg/L, depth-averaged). A study that measured TSS concentrations at distances of 152, 305, 610, and 1,006 m (500, 1,000, 2,000, and 3,300 ft) from dredge sites in the Delaware River detected concentrations between 15 mg/L and 191 mg/L up to 610 m (2,000 ft) from the dredge site. In support of the New York/New Jersey Harbor Deepening Project, the USACE conducted extensive monitoring of mechanical dredge plumes and found that plumes dissipated to background levels within 183 m (600 ft) of the source in the upper water column and 732 m (2,400 ft) in the lower water column, regardless of bucket type. Based on these studies, elevated TSS concentrations (several hundred mg/L above background) may be present in the immediate vicinity of the bucket but would settle rapidly within a 732 m (2,400 ft) radius of the dredge location. The TSS levels found to be associated with mechanical dredging (up to 445 mg/L) are below those shown to have adverse effects on fish (typically up to 1,000 mg/L) (NOAA Fisheries 2020b).

High TSS levels can cause a reduction in dissolved oxygen levels. Sturgeon may become stressed when dissolved oxygen falls below certain levels. A study of shortnose sturgeon found that high rates of mortality can occur in younger sturgeon when dissolved oxygen levels are low, while older individuals can tolerate those reduced oxygen levels for short periods. However, chronic exposure to low levels of dissolved oxygen may result in reduced tolerance. Exposure of sturgeon to TSS levels of 1,000 mg/L above ambient for longer than 14 days at a time may result in behavioral and physiological effects. NOAA Fisheries recommends that sturgeon early life stages not be exposed to more than 50 mg/L of TSS. While the increase in TSS from pile driving or dredging in the action area may cause Atlantic sturgeon to alter their normal movements, these minor changes in movements would be too small to be meaningfully measured or detected. (NOAA Fisheries 2020)

The areas of estuarine habitat that would be affected by turbidity from the Proposed Action would be minimal in comparison to the extensive surrounding areas of potential Atlantic sturgeon habitat, and few Atlantic sturgeon are expected to forage in the Project Area. Effects of turbidity on individual Atlantic sturgeon that may occur in the Project Area would be of short duration. Atlantic sturgeon would be able to swim away from the turbidity plume. Turbidity would be most likely to affect Atlantic sturgeon if a plume caused a barrier to normal behaviors, although sturgeon would be expected to swim through the plume with no adverse effects. Thus, the increase in turbidity may cause Atlantic sturgeon to alter their normal movements, but these minor changes would be too small to be meaningfully detected or measured (NOAA Fisheries 2020b). Accordingly, the impacts of turbidity on Atlantic sturgeon would be less than significant.

Capture/Entrapment during Dredging

Capture and entrapment during dredging, discussed above for sea turtles, also has the potential to impact Atlantic sturgeon. Aquatic species can be captured in dredge buckets and may be injured or killed from entrapment in the bucket or burial in sediment during dredging and deposition of sediment into the dredge scow. Fish captured and emptied out of the bucket could suffer severe stress or injury, which could also lead to mortality (Hopper 2021).

Nearly all of the recorded interactions between mechanical dredges and sturgeon have occurred during dredging in the Kennebec River at the Bath Iron Works facility in Maine. It is unknown if this is due to a unique situation in this river or the intense observer coverage during dredging operations in this river, which happen nearly every year. During ten dredging events at Bath Iron Works between 1997 and 2012, only three interactions of mechanical dredges with sturgeon were recorded: two (one lethal) with shortnose sturgeon (2003 and 2009) and one with an Atlantic sturgeon (2001). An Atlantic sturgeon was also reported killed in the Cape Fear River, North Carolina in a bucket and barge operation. Very few other mechanical dredge operations have employed observers to document interactions between sturgeon and the dredge; therefore, it is possible that interactions during other projects have occurred but have not been observed (Hopper 2021).

The areas of estuarine habitat that would be affected by dredging under the Proposed Action would be minimal in comparison to the extensive surrounding areas of potential Atlantic sturgeon habitat, and few Atlantic sturgeon are expected to forage in the Project Area. Given the expected low density of Atlantic sturgeon in the Project Area, the species is unlikely to be entrained during dredging. Additionally, protected species observers stationed onboard dredges during two prior SRIPP offshore dredging events evaluated every load and did not document a sturgeon entrainment during either dredging event (NASA 2010b). Based on the best available information, the mobility of the sturgeon, the expected transitory occurrence and low density of Atlantic sturgeon in the Project Area, the relatively small size of the area to be dredged, and the infrequency of dredging, the probability of a sturgeon being captured in a slow-moving dredge bucket in the action area is low. This conclusion is further supported by the small number of sturgeon captured during dredging operations at Bath Iron Works and elsewhere. Therefore, it can be concluded that the capture or entrapment of Atlantic sturgeon by a clamshell bucket during proposed dredging would be extremely unlikely and less than significant (Hopper 2021).

Vessel Strikes

Vessel strikes, discussed above for sea turtles, are also applicable to Atlantic sturgeon. Large fish such as the Atlantic sturgeon have a potential for injury or mortality because of vessel strikes. Unlike sea turtles, however, these fish do not need to breathe air and do not spend substantial time at or near the surface where they would be most at risk. Atlantic sturgeon also swim faster than sea turtles and are better able to avoid vessels. It would be extremely unlikely for a vessel related to the Proposed Action to strike and injure or kill a sturgeon given the nature of the habitat in the Project Area; small number of sturgeon in the area; the low baseline risk of vessel strikes in the area; and the extremely small, intermittent, and temporary increase in vessel traffic that would be added to existing traffic in the area as a result of the project. Additionally, vessels entering the inlet would reduce speed, further decreasing the probability of vessels strikes. It is estimated that there would be only a slight increase in risk from the minimal number of additional vessels added to baseline activity in the action area during construction and operations, and that any associated increase in vessel strikes would be extremely small and less than significant.

Noise

Atlantic sturgeon potentially could be affected by underwater noise produced during construction or operation of the Proposed Action, including noise from pile driving, vessels, and dredging. As discussed above for sea turtles, GARFO developed a spreadsheet Acoustics Tool (NOAA Fisheries 2020a) and an SAF for use in estimating the ensonification area of pile-driving projects in shallow, inshore environments, such as the bays and waterways of the Project Area. Based on the characteristics of the proposed pile driving, the noise levels at the source associated with pile driving for the Proposed Action were estimated and used in the GARFO model to estimate the distances from pile-driving activities at which thresholds for noise-related effects would be exceeded.

The evaluation of potential effects on the Atlantic sturgeon from pile-driving noise used the model to estimate distances from the pile-driving location at which fish injury and effects thresholds may be exceeded. The results indicate that exposure to an SPL_{peak} that may result in injury to sturgeon is not anticipated to occur during pile driving for the Proposed Action because the SPL_{peak} at the source (185 dB re 1 Pa) would be less than the effects threshold (206 dB re 1 Pa). However, based on the SEL exposure criterion, injury to a sturgeon potentially could occur if the fish remained within 30 m (98 ft) while the pile was being driven. This is extremely unlikely to occur because sturgeon would be expected to modify their behavior and move away from the source upon exposure to underwater noise levels greater than the behavioral effects threshold (SPL_{rms} = 150 dB re 1 µPa). Sturgeon would be exposed to levels of noise that cause behavioral modification at 50 m (164 ft) according to the model estimate and would be expected to move away from the sound source before cumulative exposure could result in injury. If a sturgeon were within 30 m (98 ft) of the pile at the time pile driving begins, it likely would leave the area quickly. Additionally, the use of a soft start technique should also give any sturgeon in the area time to move out of the range of any potential injury from noise. Therefore, noise injury to sturgeon is not anticipated.

Behavioral effects, such as avoidance of the area or disruption of foraging activities, may occur in sturgeon exposed to noise above the behavioral threshold (SPL_{rms} = 150 dB re 1 µPa). Underwater noise levels are predicted to be below this threshold at distances beyond approximately 50 m (164 ft) from the pile being installed. As discussed above, it is reasonable to assume that a sturgeon within the action area that detects underwater noise levels of 150 dB re 1 µPa would modify its behavior and redirect its course of movement away from the noise source. The waterway at the location where the pier would be constructed is approximately 1.6 km (1 mi) wide, providing extensive habitat in which a sturgeon could avoid the ensonified area. It is extremely unlikely that these movements would affect essential sturgeon behaviors such as spawning, foraging, resting, or migration. The Proposed Action area is not sturgeon spawning habitat, and the bays and waterways of the area are sufficiently extensive to allow sturgeon to avoid the area of elevated noise while continuing to forage and migrate. Given the small distance that a sturgeon would need to move to avoid disturbing levels of noise, any effects would not be measurable or detectable and, therefore, would be insignificant.

A soft-start procedure would be used for pile driving to allow sturgeon that may be in the Project Area to detect the presence of noise-producing activities and to depart the area before full-power pile driving begins. A bubble curtain around each pile being driven could be used for noise attenuation (see Section 4.2). Bubble curtain effectiveness can be highly variable depending on local conditions and the type of system used. Given the uncertainty associated with the potential use of bubble curtains for noise attenuation, this evaluation was conservative, and the estimated effects of using a bubble curtain were not included in the modeling of threshold distances.

Noise generated by vessels during project construction or vessels calling on the pier during its operation potentially could affect sturgeon in the Project Area. The area is already affected by anthropogenic noise from vessels and other sources. Construction and use of the pier would cause additional noise in the area. The noise produced by vessels during project construction would vary depending on the vessel size, speed, and whether it uses dynamic positioning thrusters. Noise from vessels traveling to and from the pier potentially would cause behavioral disturbance to sturgeon but would not result in injury. When vessels are underway in open waters, sturgeon in adjacent areas could be disturbed. However, construction vessels and vessels visiting the pier during operation would be shallow-draft, slow-moving, and likely would produce noise levels less than the behavioral effects level for sturgeon. Noise from project vessels during construction and operation would not be expected to potentially cause more than local and temporary behavioral responses in sturgeon if present nearby. The presence of a sturgeon foraging or migrating through the Proposed Action area at the time of a vessel visit is unlikely.

Noise from dredging vessels and associated equipment and operations was evaluated by NOAA Fisheries in a 2012 BO, which concluded that the effects of dredge noise on whales are discountable (NASA 2018). Similarly, the numbers of sturgeon in the Proposed Action area are very low, and it is extremely unlikely for a sturgeon to occur close enough to the dredge to be disturbed by noise.

Thus, the overall likelihood of a sturgeon being adversely affected by noise from construction or operation of the Proposed Action also would be extremely low, and any potential effects would be less than significant.

Giant Manta Ray

The giant manta ray is rare, solitary, and migratory, and the Project Area does not provide optimal habitat or food sources. Thus, the giant manta ray is extremely unlikely to occur in the area. Effects from the Proposed Action on the giant manta ray can be assumed to be similar to effects on the Atlantic sturgeon. Noise from pile driving would not cause injury to a giant manta ray and, given the small distance that a giant manta ray would need to move to avoid disturbing levels of noise, any effects would not be measurable or detectable and, therefore, would be insignificant. The overall likelihood of a giant manta ray being adversely affected by noise or other effects from construction or operation of the Proposed Action would be extremely low, and any potential effects would be less than significant.

Summary of Effects on Listed Species

Generally, effects on federal and/or state listed species would occur at the individual rather than the population, or community level and would not prevent or delay the continued propagation of any species. The intensity, duration, and extent of construction activities would vary and be distributed throughout the Proposed Action's multi-phase and multi-year implementation period, thereby ensuring that not all impacts would occur simultaneously. Contractors would implement and adhere to BMPs to the extent practicable to further minimize adverse effects on listed species. BMPs could include but would not be limited to using sediment curtains during in-water work to contain disturbed sediments and the use of protected species observers (see Section 4.2).

Due to the low number of sea turtles, Atlantic sturgeon, and giant manta rays in the vicinity of Wallops Island, and with the implementation of the conservation and mitigation measures discussed above, construction and dredging activities, including dredged material placement, would not result in substantial impacts on listed sea turtles, the Atlantic sturgeon, or the giant manta ray. It is likely that individual animals, particularly highly mobile species such as sea turtles and fish, would be alerted to the increased human presence and vessel activity and relocate to quieter or less-disturbed areas nearby that offer similar habitat conditions. While this would be an adverse effect, avoidance of the Project Area by individual animals during construction activities would not be anticipated to substantively affect migration, mating, foraging, or nesting behaviors.

For these reasons, short-term impacts on listed species from construction and dredging under the Proposed Action would be negligible and less than significant. In the long term, the operation of the MARS Port may affect, but would not adversely affect, any federal or state listed species. Associated human activity and increases in vehicle and vessel traffic would likely encourage individuals to avoid developed areas around the port. These individuals would be expected to relocate to quieter and undeveloped or less-developed areas nearby that offer extensive suitable habitat.

In a letter dated February 28, 2023, NOAA Fisheries concurred with NASA's determinations regarding listed aquatic species, and provided additional clarifications to support the conclusions, but did not provide any additional recommendations. USFWS concurred in a letter dated March 2, 2023, provided that NASA comply with suggested minimization measures (summarized in Section 4.2, below) and the existing BO (**Appendix E**). Prior to undertaking pile-driving or dredging activities, any conservation or mitigation measures recommended by NOAA Fisheries or USFWS during consultation would be employed to avoid or reduce impacts to listed species under their respective jurisdictions. NOAA Fisheries and USFWS have identified conservation measures such as listed species observers or time-of-year restrictions for pile-driving activities . As determined to be necessary to avoid inadvertent strikes of aquatic listed species, vessel operators may be required to use trained spotters in accordance with NOAA guidance (e.g., *Vessel Strike Avoidance Measures and Reporting for Mariners* [NOAA Fisheries 2008] or *Sea Turtle and Smalltooth Sawfish*

Construction Conditions [NOAA Fisheries 2006]). The presence of observers may be required during in-water construction or dredging activities so that the activity may be temporarily suspended if a listed species is identified in the vicinity. In accordance with the USFWS BO for Proposed and Ongoing Operations and Shoreline Restoration/Infrastructure Protection Program at WFF (USFWS 2016), NASA WFF would continue to manage federally listed and other special-status species in accordance with its *Protected Species Monitoring Plan* throughout the implementation and operation of the Proposed Action. The operation of the proposed MARS Port would not prevent or delay the continued propagation of any listed species, population, or community occurring at or near NASA WFF.

NASA has determined that construction and operations activities under the Proposed Action may affect but are not likely to adversely affect the following federal and/or state listed species that may occur in the Project Area: northern long-eared bat; tricolored bat; red knot; piping plover; eastern black rail; peregrine falcon; loggerhead, leatherback, hawksbill, Kemp's ridley, and green sea turtles; Atlantic sturgeon; and giant manta ray. These components of the Proposed Action would have no effect on the following federal and/or state listed species: northeastern beach tiger beetle, seabeach amaranth, roseate tern, Wilson's plover, gull-billed tern, and loggerhead shrike. Dredged material placement on beaches in the SERP area would likely have some adverse effects on the red knot, piping plover, and loggerhead sea turtle. However, Bos by USFWS and NMFS of the SERP activities, including offshore dredging and onshore excavation and backpassing of beach sand, in addition to placement of sand on beaches for renourishment, determined that SERP activities would not result in jeopardy to these three species and would be minimized by required conservation measures, such as time-of-year restrictions for dredge material placement. Accordingly, impacts on listed species would be less than significant.

3.9.2.2.2 Migratory Birds

The Project Area includes habitats that are used by a variety of birds; thus, there is a potential for impacts to birds protected under the MBTA. Adult birds are highly mobile and able to avoid construction activities that could cause injury. The birds with the greatest susceptibility to injury or mortality would be immobile nestlings or eggs present during the construction period. Construction under the Proposed Action would permanently remove approximately 0.8 ha (2.1 ac) of vegetation in the Project Area, primarily in upland areas adjacent to and near the UAS Airstrip. This small area provides limited habitat for nesting birds, and the likelihood of active nests being present at the time of clearing is very low. The impacts on migratory birds from the placement of dredged material on Wallops Island beaches in conjunction with the SERP is discussed in Section 3.7.2.2, which concludes that the placement of dredged material on beaches in conjunction with the SERP would have short-term adverse effects on birds while the effects from beach restoration over the long term would likely be mainly beneficial. Therefore, take of birds under the MBTA likely would be avoided, and impacts of the Proposed Action on migratory birds would be less than significant.

3.9.2.2.3 Marine Mammals

The marine mammals with a potential to occur in the shallow, inshore waters adjacent to the Project Area are the bottlenose dolphin, harbor porpoise, harbor seal, and gray seal. These relatively small, fast-swimming cetaceans and seals have the greatest possibility of being affected by project activities if exposed to pile-driving noise, vessel and dredging noise, and vessel strikes. The effects of the Proposed Action on these marine mammal species are evaluated below.

Pile-Driving Noise

As discussed above for the Atlantic sturgeon and sea turtles, the NOAA Fisheries GARFO SAF model (NOAA Fisheries 2020a) was used for analyzing the effects of pile driving on marine mammals in inshore waters.

The GARFO model was used to estimate the distances from pile-driving activities at which thresholds for noise-related effects in marine mammals would be exceeded. Effects can range from behavioral changes or disturbance to physical injury. Based on the characteristics of the proposed pile driving (an impulsive sound source) information for a similar, proxy project (where noise at the source was measured at 10 m (33 ft) from the pile being driven) from the GARFO SAF spreadsheet is shown in **Table 3.9-2.** The GARFO SAF model uses an attenuation rate of 5 dB/10 m. GARFO considers that rate to be a conservative estimate of the likely absorption of sound into the seafloor and representative the most common value from the range of attenuation rates observed as sound waves get farther from the source and cover a wider area (NOAA Fisheries 2020a).

Table 3.9 2. Proxy Project for Estimating Underwater Noise

Water Depth	Pile size	Pile type	Hammer type	Estimated SPL_{peak} (dB re 1 Pa)	Estimated SEL_{cum} (dB re 1 μPa²s)	Estimated SPL_{rms} (dB re 1 μPa)	Attenuation Rate (dB/10 m)
5 m (16.4 ft)	61 cm (24 in)	Concrete	Impact	185	160	170	5

dB re 1 µPa = sound exposure level in decibels relative to 1 microPascal; dB re 1 µPa2s = sound exposure level in decibels relative to 1 microPascal squared second; rms = root mean square; SEL_{cum} = cumulative sound exposure level; SPL = sound pressure level
Source: NOAA Fisheries 2020a

The thresholds for effects vary among types of organisms. NOAA Fisheries has developed acoustic criteria for the protection of all marine mammal species from exposure to high underwater SPLs. Recognizing that marine mammal species do not have equal hearing sensitivities, marine mammals have been separated into five hearing groups (NOAA Fisheries 2018b). These include three cetacean and two pinniped hearing groups:

- *Low-frequency cetaceans* – baleen whales, with a collective generalized hearing range of approximately 7 hertz (Hz) to 35 kilohertz (kHz);

- *Mid-frequency cetaceans* – most dolphins, all toothed whales except *Kogia* species, and all beaked and bottlenose whales with a generalized hearing range of approximately 150 Hz to 160 kHz;
- *High-frequency cetaceans* – all true porpoises and *Kogia* species, with a generalized hearing range of approximately 275 Hz to 160 kHz;
- Phocid pinnipeds (underwater) (true seals) – with a generalized hearing range of approximately 50 Hz to 86 kHz; and
- Otariid pinnipeds (underwater) (sea lions and fur seals) – with a generalized hearing range of approximately 60 Hz to 39 kHz (NOAA Fisheries 2018b).

The cetaceans that may occur in the vicinity of the Proposed Action are the bottlenose dolphin (mid-frequency) and harbor porpoise (high-frequency). The seals that may occur in the area, the harbor seal and gray seal, are phocid pinnipeds (true seals); otariid pinnipeds do not occur in the Project Area. **Table 3.9-3** summarizes noise injury thresholds for marine mammals by hearing group for impulsive noise such as from pile driving. It provides the thresholds at which the three hearing groups of cetaceans and the pinniped group potentially occurring in the region (seals) would experience permanent changes in hearing sensitivity (i.e., a permanent threshold shift [PTS]) from exposure to anthropogenic sources of underwater noise. For comparison, it also provides the threshold for behavioral response, which is the same for all four hearing groups.

Table 3.9 3. Underwater Noise Injury and Behavioral Response Criteria for Marine Mammals

Hearing Group	Permanent Injury (PTS), SPL_{peak} (dB re 1 µPa)[a]	Permanent Injury (PTS), SEL_{cum} (dB re 1 µPa2s)[a]	Behavioral Response, SPL_{rms} (dB re 1 µPa)[b]
	Impulsive	Impulsive	Impulsive
Low-frequency cetaceans	219	183	160
Mid-frequency cetaceans	230	185	160
High-frequency cetaceans	202	155	160
Phocid pinnipeds (true seals)	218	185	160

dB re 1µPa = decibels relative to 1 microPascal; dB re 1 µPa2s = decibels relative to 1 microPascal squared second; PTS = permanent threshold shift; SPL_{rms} = root mean square; SEL_{cum} = cumulative sound exposure level; SPL = sound pressure level
[a] Source: NOAA Fisheries 2018b
[b] Source: NOAA Fisheries 2020a

The behavioral threshold for marine mammals (SPL_{rms} = 160 dB re 1 µPa) is applicable to dolphins, porpoises, and seals. Behavioral effects, such as avoidance of the area or disruption of foraging activities, may occur in marine mammals exposed to impulsive noise above the behavioral threshold. The GARFO SAF spreadsheet model was used to estimate the distance to the marine mammal behavioral threshold from pile-driving in the shallow, inshore bays and waterways of the Project Area. The model estimates were based on the characteristics of the proposed pile driving

(**Table 3.9-2**). Similar to the discussions in 3.7.2.2. and 3.9.2.2 above, the difference of 10 dB re 1 µPa between the noise level at the source (SPL_{rms} = 170 dB re 1 µPa) and the behavioral threshold (SPL_{rms} = 160 dB re 1 µPa) was divided by the attenuation rate (5 dB/10 m), and the result was adjusted to account for the units of the attenuation rate and fact that the source was measured at 10 m (33 ft) from the pile being driven. On this basis, underwater noise levels were estimated by the GARFO model to be below the behavioral threshold at distances beyond approximately 30 m (98 ft) from the pile being driven.

Dolphins, porpoises, and seals are highly mobile and would be able to avoid the activity and noise associated with pile driving. It is reasonable to assume that a marine mammal within the vicinity that detects underwater noise levels of 160 dB re 1 µPa would modify its behavior and redirect its course of movement away from the area impacted by sound. It is extremely unlikely that these movements would affect essential behaviors such as foraging, resting, or migration. The Proposed Action area is not high-quality habitat for marine mammals, and the bays and waterways of the area are sufficiently extensive to allow individuals to avoid the area impacted by sound, while continuing to forage and migrate. Given the small distance that a marine mammal would need to move to avoid the disturbing levels of noise, any effects would not be measurable or detectable and, therefore, would be insignificant.

The GARFO SAF spreadsheet model was not designed for use in assessing potential physical injury to marine mammals from underwater noise. However, threshold distances for injury are less than the threshold distance for behavioral effects. This is because sound levels capable of causing injury are necessarily higher than those that elicit a behavioral response only, and the higher levels occur closer to the source.

To be exposed to potentially injurious levels (i.e., PTS) of noise during pile installation, a marine mammal would need to remain within 30 m (98 ft) of the pile during the time it is being driven. Exposure of a marine mammal to noise within this distance is extremely unlikely to occur because marine mammals are highly mobile and would be expected to modify their behavior and move away from the source upon exposure to underwater noise levels greater than the behavioral effects threshold. Thus, marine mammals would be exposed to levels of noise that cause behavioral modification at 30 m (98 ft) according to the model estimate and would be expected to move away from the sound source before exposure could result in injury. If a marine mammal were within 30 m (98 ft) of the pile at the time pile driving begins, it would leave the area quickly. Additionally, the use of a soft-start technique should also give any marine mammal in the area time to move out of the range of any potential injury from noise. Therefore, no noise injury to marine mammals is anticipated, and the potential for a marine mammal to be adversely affected by noise during pile driving for construction of the Proposed Action is minimal and less than significant.

Mitigation measures for pile-driving noise would include a soft-start procedure (i.e., pile is initially driven with a low hammer energy that is gradually increased) to allow marine mammals that may be in the Project Area to detect the presence of noise-producing activities and to depart the area before full-power pile driving begins. Soft-start procedures would not begin until the exclusion zone, which would surround the project location and be monitored for the presence of marine mammals, has been cleared. A bubble curtain around each pile being driven could be used for noise attenuation (see Section 4.2). The estimated effects of using a bubble curtain were not included in the calculation of threshold distances using the GARFO SAF spreadsheet model.

Sediment suspension and acoustic vibration associated with pile driving at the boat dock could affect the navigation and behavior of sea turtles or marine mammals. To mitigate any adverse effects, each day during pile driving, or prior to resuming pile driving after a greater than 30-minute pause, a trained observer would perform a visual "sweep" of the waterways adjacent to the pier. If a sea turtle or listed marine mammal is found within 460 meters (1,500 feet) of the work area, pile driving would be stopped until the animal has moved outside of the observation area. NASA and VCSFA would encourage the construction contractor to install pilings by vibratory techniques rather than hammer methods in an effort to reduce the noise and vibration of the pile driving installation. Given this use of observers and the short effects threshold distances calculated by the model without the assumption of bubble curtains, the use of bubble curtains for additional noise attenuation would not be warranted.

Vessel and Dredging Noise

Noise generated by vessels traveling (a non-impulsive sound source) during construction or vessels calling on the pier during its operation, could potentially affect marine mammals in the vicinity of the Proposed Action. Noise from vessels traveling to and from the pier may cause behavioral/disturbance effects in marine mammals but would not cause injury. Smaller ships such as tugs or trawlers produce broadband noise with a typical SPL of 168 to 170 dB re 1µ Pa at 1 m (3.3 ft), while larger ships such as supertankers produce underwater broadband noise at source levels of up to 190 dB re 1 µPa at 1 m (Spiga et al. 2012). These SPLs are less than the marine mammal noise response criteria for injury (**Table 3.9-3**) but are above the marine mammal noise response criterion for non-impulsive behavioral effects (120 dB re 1µ Pa). However, a marine mammal would need to be near the vessel to experience sound levels that exceed the 120 dB re 1µ Pa behavioral effect threshold.

Construction vessels and vessels visiting the pier would be mainly slow-moving barges and tugs, thereby increasing the likelihood that the noise produced would be less than the non-impulsive behavioral effects level for marine mammals. AUVs would also be launched from the MARS Port that would be faster than barges, but much smaller. Noise from project vessels during construction and operation would not be expected to cause more than local and temporary behavioral responses in marine mammals if present in the immediate vicinity. The presence of marine mammals is not considered likely in the shallow, inshore habitats around the Proposed Action. The probability of a marine mammal foraging or migrating through the area at the time of a vessel visit is expected to be low. If present, however, marine mammals are highly mobile and would be able to avoid vessels that produce disturbing levels of noise.

Noise from dredging vessels and associated equipment and operations was evaluated by NOAA Fisheries in a 2012 BO, which concluded that the effects of dredge noise on whales are discountable. Similarly, the numbers of bottlenose dolphins, harbor porpoises, and harbor and gray seals in the Proposed Action area are low, and it is extremely unlikely for these marine mammals to occur close enough to the dredge to be affected by noise. In addition, mitigation measures would be employed using protected species observers, which would halt dredging operations if a marine mammal is observed within a minimum defined distance (e.g., 1 km [0.5 nautical mi]) of the dredge (NASA 2018). Thus, the overall potential for impacts on marine mammals from vessel and dredging noise would be minimal and less than significant.

Vessel Strikes

The dredging of new channels and turning basins as part of the Proposed Action would increase vessel traffic in the area during dredging operations, and the use of the navigation channel during operation of the proposed pier would result in additional vessels transiting through the area in the future. Any increases in vessel traffic may not directly correlate to more vessels in the Project Area, as active vessels in the area may move elsewhere or be retired from use. During dredging and placement of dredged material, only one or two project vessels would likely be utilized, and the use of dredging vessels would be intermittent (every 3-4 years), temporary, and restricted to a small portion of the overall Proposed Action area on any day that dredging occurs.

In accordance with NOAA Fisheries recommendations, vessels involved in pile driving, construction, dredging, and spoil placement would use trained protected species observers to monitor for marine mammals and other protected species in the area of operations. Monitoring and exclusion zones would be established around the location of activities that could cause injury or disturbance to marine mammals, and operation of moving equipment would cease if a marine mammal is observed within 45 m (150 ft). Construction vessels would travel at a slow, safe speed, and observers would maintain a vigilant watch for marine mammals. Vessels would operate at idle/no wake speeds when in project construction areas, in water depths where the draft of the vessel provides less than 1.2 m (4 ft) of clearance from the bottom, and in all depths after a marine mammal has been observed in or has recently departed the area (see Section 4.2) (NOAA Fisheries 2021b, NOAA Fisheries 2021c).

During the period of operation after dredging of the existing channel and new turning basin is completed, there would be an increase in the baseline number of vessels or changes in vessel traffic patterns due to vessels transiting to the MARS Port pier. However, given the nature of the habitat in the Project Area; the low baseline risk of vessel strikes in the area; and the extremely small, intermittent, and temporary increase in vessel traffic that would be added to existing traffic in the area because of the Project; it would be extremely unlikely for a vessel strike related to the Proposed Action to occur in the area. Also, given the great mobility and agility of the marine mammal species potentially occurring in the Proposed Action area and that the area is in a coastal environment where these species can disperse widely, the risk of vessel strike is extremely unlikely. Additionally, vessels in the area entering the inlet would reduce speeds, further reducing the probability of vessels strikes. In accordance with NOAA Fisheries vessel strike avoidance recommendations (NOAA Fisheries 2021c), vessels would operate at idle/no wake speeds when in water depths where the draft of the vessel provides less than 1.2 m (4 ft) of clearance from the bottom, and in all depths after a marine mammal has been observed in or has recently departed the area. As a result of these factors and measures, the effect of the Proposed Action on the risk of a vessel strike on marine mammals (e.g., bottlenose dolphin, harbor porpoise, and harbor and gray seals) in the Project Area would be less than significant.

Furthermore, during construction and operation, vessels outside the Project Area but in transit to or from the proposed pier would also comply with all NOAA Fisheries rules and notifications regarding reducing speeds to protect North Atlantic right whales (see Section 4.2). For example, vessels not owned or operated by, or under contract to, the federal government and that are greater than or equal to 19.8 m (65 ft) in overall length must slow to 10 knots or less when entering right whale Seasonal Management Areas in the mid-Atlantic region from November 1 to April 30 (50 CFR § 224.105). The closest seasonal management areas to the Proposed Action area are at the mouth of Chesapeake Bay and the mouth of Delaware Bay. Such vessels are also encouraged by NOAA Fisheries to slow to 10 knots or less in NMFS designated Dynamic Management Areas, which may be established by NOAA Fisheries based on recent visual sightings of right whales within a discrete area and are announced to mariners through customary maritime communication media. These measures would further ensure that the effects of the Proposed Action due to vessel strikes on marine mammals would be less than significant.

3.9.2.3 *Alternative 1: Phase 1 Only*

Short-term and long-term impacts on special-status species from Alternative 1 would be similar to those described for the Proposed Action. However, the duration, extent, and intensity of impacts would be less relative to the Proposed Action due to Alternative 1's reduced scope. Construction and operational activities under Alternative 1 would not involve the intentional disturbance, harassment, or "take" of any special-status species. Although the Proposed Action would occur in marsh areas that may offer suitable nesting or breeding habitat for the eastern black rail, a breeding season survey of the Project Area in June 2021 did not detect the presence of eastern black rails. Project construction and operational activities would not occur in areas offering suitable nesting or foraging habitat for the piping plover or rufa red knot and would not prevent or delay the continued propagation of any special-status species. Therefore, short-term and long-term impacts on special-status species from Alternative 1 would be negligible and less than significant.

3.9.2.4 *Alternative 2: Phases 1 and 2 Only*

For similar reasons as described for the Proposed Action and Alternative 1, impacts on special-status species from Alternative 2 would be negligible and less than significant. The duration, extent, and intensity of short-term and long-term impacts on special-status species would be less relative to the Proposed Action due to Alternative 2's reduced scope. The short-term and long-term impacts on special-status species would be greater relative to Alternative 1 due to the increased scope.

3.10 Transportation

Transportation resources refer to the infrastructure and equipment required for the movement of people and goods in geographic space. For purposes of evaluation in this EA, transportation refers to vehicles and the movement of goods and services via roads, rail systems and water transport.

3.10.1 Affected Environment

As discussed in Section 1.4, waterways near the Project Area are located along the marine highway corridor known as the M-95 Route, one of 25 existing routes of navigable waterways comprising the nation's Marine Highway System This developing network of maritime expressways connects to the M-87 Route and the M-90 Route near New York City, and the M-64 Route at Norfolk, VA. The M-95 Route stretches from Maine to Florida and is the designated shipping lane paralleling Interstate 95, the major north-south landside freight route on the East Coast (MARAD 2019b, MARAD 2020b). Regional rail freight service is provided to the Delmarva Peninsula by Bay Coast Railroad. The closest railhead to WFF (and typically the one most frequently used for unloading cargo) is in New Church, Virginia, located approximately 11 km (7 mi) to the northwest.

Roads

Traffic and congestion are constraints to the region's transportation network, which is centered around U.S. Route 13 (Route 13), a four-lane, divided, north-south highway that bisects the Delmarva Peninsula (**Figure 3.10-1**). Route 13 is the principal corridor linking the Eastern Shore of Virginia with the mainland of Virginia to the south and to the northeast through the State of Maryland. In Virginia, the Route 13 corridor traverses both Northampton and Accomack Counties, then crosses over the Chesapeake Bay Bridge Tunnel, a four-lane bridge and tunnel crossing which connects the peninsula to the mainland (VDOT 2002). Route 13 also provides an alternative to Interstate 95 for freight moving by truck among New Jersey, Delaware, Maryland, and Virginia (Accomack-Northampton Planning District Commission 2011).

There are no interstates in the region; Interstate 64 is just south of the region in Hampton Roads. As shown in **Figure 3.10-1**, the east-west primary corridors include State Road (SR)-175, SR-180, and SR-182. Due to the narrow shape of the Eastern Shore peninsula, these corridors are limited in distance. Route 13 has been designated as a Corridor of Statewide Significance because it accommodates intercity as well as interstate traffic. It is also the only hurricane evacuation route for the Eastern Shore (Accomack-Northampton Planning District Commission 2011).

Traffic in the region varies with the seasons: during the winter and early spring, traffic is minimal; during the summer and early fall, traffic surges due to increased tourism and agricultural operations in the area (NASA 2019a).

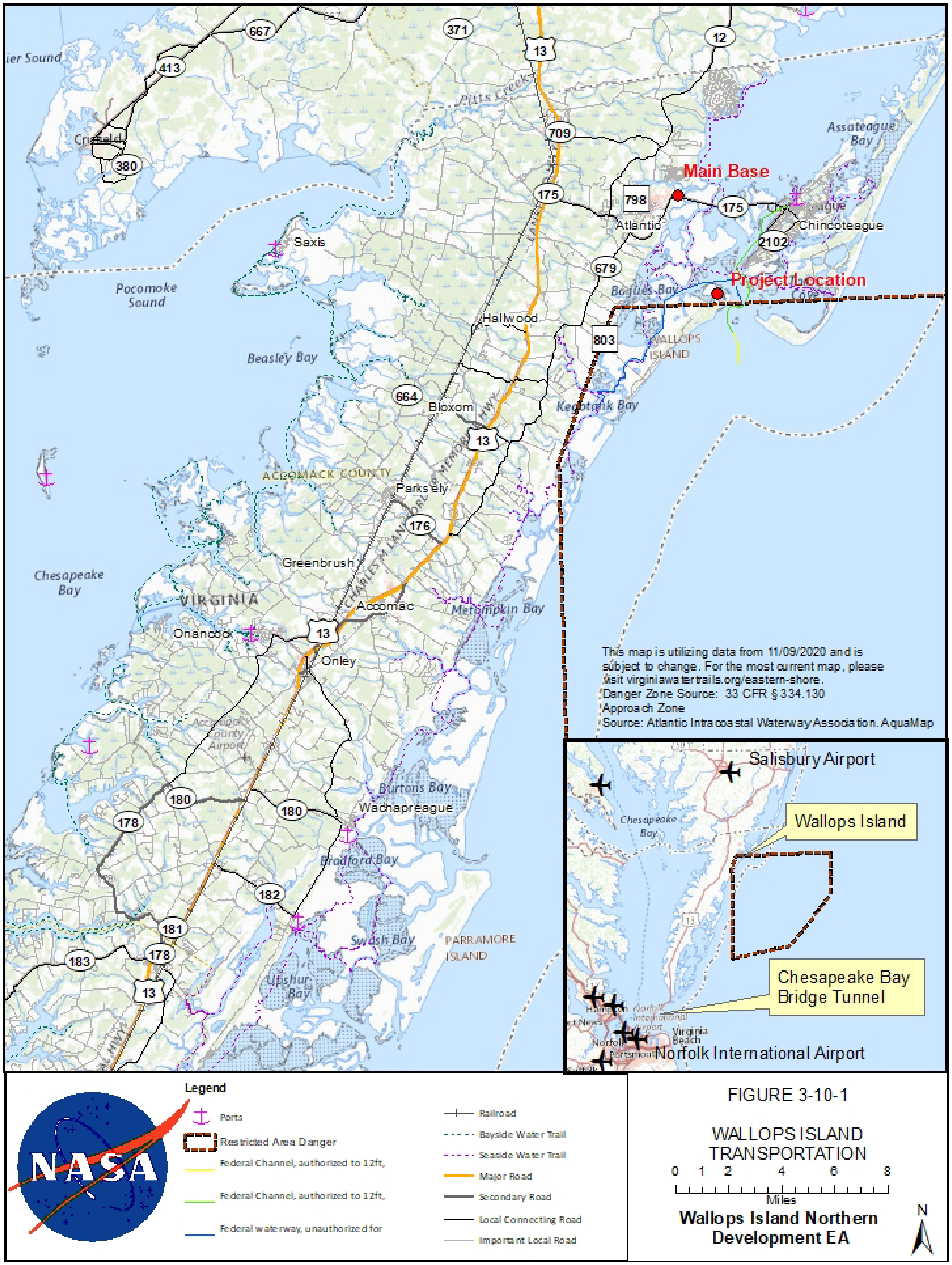

Figure 3.10-1. Transportation Network near Wallops Island

Local traffic travels by arteries branching off Route 13. Primary access to WFF and to Chincoteague and Assateague Islands is provided by SR-175 (Chincoteague Road), a two-lane, minor arterial that connects to SR-679 (Atlantic Road) and SR-798 (Mill Dam Road), both of which terminate at the WFF Main Base gate. As shown in **Table 3.10-1**, in 2017 the Annual Average Daily Traffic (AADT) of Route 13 for the portion of the road from the Maryland State Line to SR-175 near WFF was 19,000 vehicles per day. SR-175 includes an 8 km (5 mi) long causeway, the single access route to Chincoteague, which houses 10 percent of Accomack County's permanent residents. In summer, it is the route that thousands of tourists use to get to the island (Accomack-Northampton Planning District Commission 2011). In 2017, its AADT was 7,400 vehicles per day (Virginia Roads 2018).

Table 3.10 1. 2017 Average Annual Daily Traffic Volumes (AADT)

Route	From	To	Annual Average Daily Traffic (vehicles per day)
SR-175 East (Chincoteague Road)	WCL Chincoteague	Main St	6,900
SR-175 East (Chincoteague Road)	01-798 Mill Dam Rd	WCL Chincoteague	7,400
US-13 South	SR 175 Nash Corner	Maryland State Line	19,000
US-13 South	01-695 Temperanceville Rd; Saxis Rd	SR 175 Nash Corner	18,000
US-13 North	01-676 Muttonhunk Rd	01-695 Temperanceville Rd; Saxis Rd	19,000
SC-679 North (Atlantic Road)	SR 175 Chincoteague Rd	01-709 S, Justice Rd	3,600
SC-803 East (Wallops Island Road)	01-679 Atlantic Rd	End State Maintenance	1,500

Wallops Main Base and Mainland are connected by approximately 10 km (6 mi) of the paved, two-lane SR-679. AADT was 3,600 vehicles per day in 2017 (Virginia Roads 2018). Wallops Island is accessed via SR-679 which intersects with SR-803 (Wallops Island Road). AADT on SR-803 was 1,500 vehicles per day in 2017 (Virginia Roads 2018). At the intersection of Mainland Road, Wallops Island Road changes its name to Causeway Road, which leads to the NASA-owned bridge and causeway linking the mainland to Wallops Island. This critical infrastructure is the only connection to the assets and facilities located on Wallops Island. The Causeway Bridge is over 50 years old and is an institutional support project included in the *Final Site-wide PEIS* from which this EA is tiered (NASA 2019a). Accelerated deterioration of the bridge has been attributed to the volume, size of transport trucks, and frequency of traffic crossing the bridge because of expansion of the WFF Wallops Island launch facilities and development of MARS over the last decade (Accomack County 2015).

Hard surface roads provide access to most buildings at WFF and are maintained by NASA and its tenants/partners. Most organizations at WFF own and maintain a variety of vehicles, including sedans, vans, and trucks. There is no public transportation on the facility. Many WFF employees carpool to and from the facility (NASA 2019a). Access to the UAS Airstrip work area is provided via an existing gated, paved road that runs north from SR-803, and then by driving down the existing UAS Airfield access road. There is no public access to this area, and it is currently only used by NASA and MARS project personnel, customers, and contractors (NASA 2020a).

In 2002, the Virginia Department of Transportation (VDOT) prepared the Route 13 / Wallops Island Access traffic study which concluded that Route 13 traffic volume had grown steadily over the years and was projected to increase. It also indicated that vehicle crash rates and fatalities were increasing and were more likely to occur in Accomack County as compared to Northampton County due to higher traffic volumes and more side roads, roadside development, and driveways in Accomack County. The study recommended major access management improvements throughout the corridor, including $83.5 million of improvements in Accomack County. The study also recommended adoption of a Highway Corridor Overlay District by local governments to help coordinate land development and highway access management to improve safety and maintain traffic capacity. Recommended access management measures include requiring left turn lanes, right turn lanes, shoulders, driveway spacing, and side street connections (VDOT 2002). In 2020, the VDOT announced planned safety improvements at several intersections on Route 13 in northern Accomack County. Improvements will include installation of a traffic signal, speed reduction measures, additional signage, lengthened turn lanes and reduction access points from area businesses to the highway. Estimated construction costs were $2.8 million (VDOT 2020).

Various cargo, launch vehicle, and payload components are delivered to the Wallops Main Base by truck or airplane, and then transported via local roads to various facilities on Wallops Island (NASA 2009). To ensure safe transit for over-sized loads on SR-798, SR-679, and SR-803 bound for Wallops Island, Accomack County adopted a zoning ordinance to create the Wallops Space Transit Corridor overlay district in 2010. The overlay district runs along the VDOT right-of-way from the Main Base, through the town of Atlantic, to Wallops Island. To clear overhead obstructions, Accomack County buried existing utility lines, and VDOT modified transit signals (Accomack County 2010, NASA 2019a, Florida Spacereport 2011). The ordinance also prohibits any development above the surface of the VDOT-maintained pavement, and the encroachment of vegetation within the transit corridor (Accomack County 2010).

Public Transportation

STAR Transit provides flexible, fixed-route bus service that connects Virginia Eastern Shore towns and provides north-south bus transit. The Pony Express serves the Town of Chincoteague during the summer and on weekends in late spring and early fall with two fixed routes. There are more than 30 km (20 mi) of bicycle and pedestrian pathways on the Eastern Shore that are part of the transportation network. Several roadways in both counties have pavement widths or shoulders that can accommodate bicycles (Accomack-Northampton Planning District Commission 2011).

Greyhound bus serves two stops on the Virginia Eastern Shore providing access south to Virginia Beach and Norfolk, or north to Philadelphia (PA) and New York (NY). There are no Amtrak rail stations on the Eastern Shore. The closest station is in Norfolk at Tides' Stadium, served by the Northeast Regional route. The route connects Virginia Beach (by thruway bus) to Boston (MA) via Richmond, Washington D.C., Baltimore (MD), Philadelphia (PA), New York (NY) and New Haven (CT) (Accomack-Northampton Planning District Commission 2011).

There are no commercial airports in the region. However, Norfolk International Airport is located 95 km (60 mi) to the south; Salisbury Airport is located approximately 95 km (60 mi) to the north. There are three general aviation airports in the region. Access to public boat ramps and ferry service to Tangier Island are important services to the public (Accomack County Planning 2014).

Railroad

Regional rail freight service is provided to the Delmarva Peninsula by Bay Coast Railroad, which has more than 145 km (90 mi) of track that cover the length of Accomack and Northampton Counties. The Bay Coast rail line connects to the Maryland Rail line to the north and the Norfolk-Southern rail line to the south. The southern connection is made by use of a barge which carries rail cars from the port of Cape Charles to the port of Hampton Roads. The Port of Hampton Roads is served by 70 steamship lines linking it with 100 foreign countries through 260 overseas ports (Accomack County Planning 2014).

There is no rail freight or passenger service available to WFF. The closest railhead to WFF (and typically the one most frequently used for unloading cargo) is the LeCato site in New Church, Virginia. Rail freight bound for WFF is offloaded at the LeCato site and hauled by truck to its final destination (NASA 2019a).

Water

The area off the coast of Virginia is one of the busiest in the world in terms of maritime traffic (commercial, recreational, and military). Traffic Separation Schemes, specified in 33 CFR Part 167 – Offshore Traffic Separation Schemes, are one-way ship traffic lanes that are marked by buoys to prevent vessels from colliding with each other while underway. The nearest Traffic Separation Schemes lanes to WFF are the southernmost approaches to the Delaware Bay, which are approximately 90 km (50 nautical mi) north of Wallops Island, and the northernmost lanes of the Chesapeake Bay approach, which are approximately 100 km (55 nautical mi) south of Wallops Island (NASA 2019a).

Ocean cargo shipments bound for WFF are typically offloaded at the Port of Baltimore, Maryland, or Cape Charles, Virginia, and transferred to commercial trucks or rail for transport to WFF. An additional sea-based cargo transport option exists which utilizes Chincoteague Inlet to access the boat docks at the Main Base Visitor Center. Dredging the channel between the two basins and nearby waterways to remove long term sedimentation was contemplated as an institutional support project in the *Final Site-wide PEIS*. Existing depths of this non-federal channel are not adequate to accommodate the vessel types necessary to support barge transfer of cargo carrying large space assets (NASA 2019a).

Waterways near Wallops Island are open year-round for commercial and recreational fishing and boating. Virginia's water trails are valuable education, recreation and tourism resources that provide economic development opportunities for the rural Eastern Shore. However, natural processes and severe weather negatively impact water depths, resulting in restricted navigability that impact all users.

To recognize the needs of shallow-draft navigation users, Accomack and Northampton counties created a regional navigable waterways committee to address waterway maintenance. In 2017, the committee produced the Eastern Shore of Virginia Regional Dredging Needs Assessment report to assist public policy decision makers by defining the existing conditions of local waterways and describing the problems, needs, and opportunities associated with their use and maintenance. According to the report, "safely navigable waterways, dredged to an adequate depth for their varied uses are vital to the economy, culture, and quality of life for residents of and visitors to the [region]." The Eastern Shore of Virginia Regional Dredging Needs Assessment evaluated the condition of 59 waterways of Virginia's Eastern Shore, including 32 federal project areas and 27 non-federal waterways. Of the federal waterways, about 69 percent (22 waterways) did not meet their respective authorized depths and about 31 percent (10 waterways) had sections with less than 0.6 m (2 ft) of water at mean low water. Additional barriers to maintenance included expired permits, challenges with securing new permits, limited records of past dredging, and increased difficulty in securing placement for dredged material (Accomack-Northampton Planning District Commission 2017). Additionally, federal funding for shallow-draft navigation projects has been in decline for decades. Prioritization for maintenance is based on national economic benefits related to commercial navigation. As a result, maintenance of recreational waterways with limited commercial traffic has been deferred indefinitely. Projects at public marinas, such as the Willis Wharf County Marina and Wachapreague Town Marina typically cost less than $100,000 and have access to state funding with the Virginia Port Authorities Aid to Local Ports Fund. Larger channel projects often exceed $1 million in costs, and therefore can't access state funding. USACE has the authority to provide some services to states, but on a cost-shared basis (Accomack-Northampton Planning District Commission 2017).

The Virginia Seaside Water Trail runs between Chincoteague Island and the Eastern Shore of Virginia NWR at Cape Charles and passes by or through areas owned by the federal, state, and county governments, as well as private lands. The salt marshes and barrier island beaches provide world-class ecotourism destinations and paddling opportunities on the Eastern Shore. The Virginia CZM Program funded development of the water trail for non-motorized use by paddlers using kayaks or canoes, as well as several public access points (VDEQ 2019, Virginia Water Trails 2020). A separate website (VirginiaWaterTrails.com) connects locals and visitors to rural ecotourism destinations. Also, in the vicinity of Wallops Island is the federal navigation channel known as the Virginia Inside Passage (also known as Waterway on the Coast of Virginia), a 145 km (90 mi) long north-south route connecting harbors on the Eastern Shore to each other and to the Chesapeake Bay and the Atlantic Ocean. The Virginia Inside Passage is frequently used by commercial and recreational boaters but has been negatively impacted by natural shoaling and shifting of aquatic sediment. As a result, the USCG could not guarantee the passage's navigability and announced a plan to remove Aids to Navigation in 2013. Since the announcement, many Aids to Navigation have been removed. However, in response to local concerns, the USCG recently began replacing signs with buoys, so that they may be more easily moved to accurately mark the channel as it naturally shifts. In 2018, federal funding towards the maintenance dredging of the waterway was appropriated (Delmarva Now 2018, Delmarva Times 2018).

USACE has the authority to designate maritime danger zones and to set specific requirements, limit access, and control navigation activities by closing the danger zone to the public on a full-time or intermittent basis. As shown in **Figure 3.10-1**, USACE expanded the Atlantic Ocean danger zone around Wallops Island and Chincoteague Inlet, Virginia, to a 55 km (30 nautical mi) long sector necessary to protect the public from hazards associated with WFF's rocket launch operations (33 CFR § 334.130). NOTMARs are published prior to the temporary USACE closure of an area of interest within or for the entire danger zone. Typically, during launch operations only an area of interest within the danger zone would be closed. During the closure, a combination of light beacons, stationary warning balloons, and patrol water and aircraft may be used to warn the public to remain out of the danger zone until the designated area is clear and reopened for public use (NASA 2019a). As shown in **Figure 3.10-1**, the triangle shaped Wallops Island Approach Zone is located at the mouth of Chincoteague Inlet and is designed to encourage boaters to exercise caution while traversing the Inlet (NASA 2019a).

3.10.2 Environmental Consequences

Significant impacts would occur if the Proposed Action either created long-term traffic congestion on roadways or waterways that could not be alleviated or resulted in unsafe transportation conditions that could not be mitigated.

3.10.2.1 *No Action Alternative*

Under the No Action Alternative, the new MARS Port and associated infrastructure would not be constructed. None of the associated construction activities with potential to temporarily disrupt transportation in the Project Area would occur; however, none of the benefits of using the M-95 Marine Highway Corridor would be realized. The port and operations area would not become part of the M-95 Marine Highway Corridor; the opportunity to utilize the waterways near the proposed port as an extension of the overall U.S. transportation system would not be manifested. Thus, NASA, VCSFA/MARS, and other WFF tenants would continue to use existing infrastructure and available transportation routes to support their respective and expanding missions. Oversized and potentially hazardous vehicles carrying large space assets for VCSFA/MARS and NASA would continue to use existing highways and roads. Additionally, the port's use as an intermodal facility connecting maritime, rail and highway would not be realized. Future freight shipments which could have been transported via maritime transportation routes would continue to use surface transportation. As a result, landside traffic and congestion would continue its projected growth, with associated wear and tear of transportation infrastructure and associated maintenance costs (MARAD 2020a). There would be no need for dredging the existing navigation channel to support barge transfer of cargo too large for overland transport. Thus, the opportunity to provide accessibility for all watercraft would not be realized. As USACE does not currently maintain the federal channel to Bogues Bay (Chincoteague to Bogues Bay Connecting Waters), natural processes would continue to negatively impact navigability around Wallops Island to the narrows and the bay. Overall, under the No Action Alternative, the short-term direct impact would be minor; however, the long-term direct impact to surface and maritime transportation would be moderate and adverse.

3.10.2.2 *Proposed Action: Phases 1, 2, and 3*

Under the Proposed Action, the MARS Port would be constructed in three phases resulting in a 398 m (1,305 ft) fixed pier and turning basin within the vicinity of the UAS Airstrip located at the north end of Wallops Island. The Project would provide a port and operations area along with associated capabilities for VCSFA/MARS, NASA, other WFF tenants, as well as serve as a new intermodal facility for the developing MARAD M-95 Marine Highway Corridor, the designated shipping lane that parallels Interstate 95 (MARAD 2020a).

Development of a port and operations area was evaluated in the *Final Site-wide PEIS* (NASA 2019a). The pier would be designed for American Association of State Highway and Transportation Officials rating of HS-20[1], which would accommodate access by emergency vehicles, a mobile crane, and trailered equipment loads. The dock and ramp would be oriented to allow loading and unloading of barges and research vessels by a mobile crane. The existing UAS Airstrip access road at the culvert crossing is not wide enough for two-way traffic or to accept trailered loads from the proposed port. This creates a pinch point and safety and operational hazard. A 40 m (130 ft) segment of the existing paved access road would be widened from 4.5 m (15 ft) to approximately 9 m (30 ft) and, in conjunction, the culvert over which the road crosses a drainage channel to Cow Gut would also be widened.

The Proposed Action would also include the dredging of an existing channel for enhanced vessel approach purposes (**Figure 2-1**). The vessel approach channel, which interfaces with both the Chincoteague Inlet Channel and the Chincoteague to Bogues Bay Connecting Waters, would initially be used by a variety of shallow-draft (0.6 to 1.2 m [2 to 4 ft]) manned and unmanned vessels. Ultimately, the proposed channel would be approximately 3,900 m (12,800 ft) long, 30 m (100 ft) wide, and would have a final depth of 3.7 m (12 ft) below MLLW. Four potential sites for the placement of dredged material are under consideration (see Section 2.3.2).

Phase I construction of the Project would potentially utilize two crews of 10 people each working five days a week (10 hour days). Most of these workers would likely commute from the local or

[1] HS-20 is the minimum design load recommended by American Association of State Highway and Transportation Officials for bridges on Interstate highways. This loading is based on a hypothetical vehicle with one 3,625-kg (8,000-lb) axle and two 14,500-kg (32,000-lb) axles.

regional area. Other workers may come from outside the region, and many would likely stay in local hotels. The Project would be constructed over a period of up to approximately 12 months.

Under the Proposed Action, temporary impacts to traffic flow would occur during construction activities. Worker vehicles would contribute to local traffic, but the impact would be negligible. Traffic on Route 13 and secondary roads in the vicinity of WFF could be slowed and/or temporarily stopped when large vehicles and heavy equipment, such as concrete pump trucks, make deliveries to the Project Area. Secondary roads impacted include SR-175, the only roadway connection to the popular destinations of the Town of Chincoteague, the Virginia portion of Assateague Island, and the Chincoteague NWR. According to the Accomack County Comprehensive Plan, the SR-175 corridor is narrow and substandard, and requires upgrades to improve safety and traffic capacity (Accomack County Planning 2014). SR-679 and SR-803, used to access Wallops Island, would also be affected. The recent Wallops Space Transit Corridor zoning ordinance, adopted in 2010 by Accomack County, provides for safe transit for over-sized loads on SR-798, SR-679, and SR-803 bound for Wallops Island (Accomack County 2010). Therefore, the impact of traffic disruptions on Route 13 and secondary roads caused by construction vehicles would be minor and temporary. Should traffic disruption occur, mitigation such as staggered loads and safety measures such as the use of a pilot car and/or flaggers would be implemented.

Dredging operations would be performed 24 hours a day, seven days a week and may require closures of local waterways. However, there are no ferries, shipping lanes, or other large commercial maritime transportation uses in the Project Area. Local boat traffic may be slowed, stopped, or re-routed during the transportation of the equipment such as crane barges and material barges to and from the Project Area. During dredging operations, the presence of an anchored barge would result in boaters staying out of the area around the barge, but anchored barges would not impede transportation in surrounding waters. Impacts to boaters would be minor and short-term, expected to last for minutes to a couple of hours, periodically during dredging activities (i.e., turning basin and channel), which would take approximately 30 days.

Currently, oversized and potentially hazardous ELV loads for NASA and MARS operations must use existing roadways, which can increase the volume of hazardous materials on the nation's highways, damage roads, shut down highways, create traffic congestion, decrease the security of transportation, and lengthen the transportation time. Larger and more frequent rocket launches are contemplated as part of the *Final Site-wide PEIS*. The Expanded Space Program involves the potential for LFIC LVs, Venture Class LVs and SFHC LVs; and consideration of commercial human spaceflight missions. Up to six LFIC LV launches/returns to launch site landings, 12 Venture Class LV launches, and 12 SFHC LV launches per year are being considered. The Proposed Action would serve the needs of the rapidly growing civil, defense, academic, and commercial aerospace market associated with WFF's missions by shifting increasing amounts of freight from congested highways to maritime routes (NASA 2019a).

Under the Proposed Action, the port and operations area would become part of the M-95 Marine Highway Corridor. However, the port would be used exclusively for the transportation of spacecraft, AUV research, and related assets, and would not be open to the public or to any commerce. The vessels using the port would predominantly be shallow draft and slow moving, and the total number of vessel trips per year using the port would be approximately 99. For comparison, the Chincoteague Inlet serves as the entrance from the Atlantic Ocean to the largest commercial port on the Eastern Shore and supports more than 3,000 vessels a year and supports all types of commercial fishing and tourism vessels. Benefits of using marine transportation include the reduction in travel delays caused by congestion, lower greenhouse gas emissions, and higher energy conservation. Wear and tear of landside transportation infrastructure, and associated maintenance costs would be also be reduced (MARAD 2020a). Further, under the Proposed Action, public safety and the security of the assets would be enhanced, since transportation of large, sensitive, and hazardous materials is safer via maritime routes which allow for greater separation of traffic as compared to other options.

Overall, with the implementation of any necessary mitigation measures, direct impacts to transportation resources associated with the Proposed Action would be temporary and minor during construction (see Section 4.2). The Proposed Action would not cause unreasonable congestion or unsafe conditions with respect to transportation impacts on the public roads. The Proposed Action would not affect or use rail transportation. The Proposed Action would not affect airspace or public transportation. Temporary impacts to boaters and fishermen would be minor during construction and maintenance. Additionally, roadway noise associated with the transportation of heavy equipment (as discussed in Section 3.1) would be minor and temporary. There would be no adverse long-term impacts to existing transportation.

The Proposed Action is expected to result in a moderate and long-term benefit to transportation, as it will shift transportation vehicles carrying large space assets from landside highway to the maritime highway, thus reducing traffic, roadway noise, congestion and associated delays, maintenance costs and damage done to surface roads (Texas A&M 2017). Reduction of the space asset traffic would enhance public safety and well-being. While maritime traffic would be expected to increase to accommodate the shift from landside to seaside shipping, the short-term impact would be insignificant relative to overall maritime traffic in the area. In the long-term, vessel traffic would be expected to increase in relation to growth of space launches over time; however, the impact would be negligible since the port would not be open for commercial use. Under the Proposed Action, the dredging of the vessel approach channel, which interfaces with both the Chincoteague Inlet Channel and the Chincoteague Inlet to Bogues Bay Connecting Waters, would benefit all maritime users. Overall, for the reasons described above, project impacts are expected to provide beneficial long- term impacts to transportation.

3.10.2.3 *Alternative 1: Phase 1 Only*

Potential impacts of Alternative 1 on transportation resources would be less than those described for the Proposed Action due to the shorter pier length and shallower depth (9 ft) and, thus, fewer vessels would be able to use the facility.

3.10.2.4 *Alternative 2: Phases 1 and 2 Only*

Potential impacts of Alternative 2 on transportation resources would be less than those described for the Proposed Action due to the shallower depth (9 ft) and, thus, fewer vessels would be able to use the facility.

3.11 Infrastructure and Utilities

Infrastructure and utilities include potable water systems, wastewater treatment systems, electric utilities, and communication systems. The Proposed Action or action alternatives may use and improve these systems.

3.11.1 Affected Environment

3.11.1.1 *Potable Water*

As discussed in Section 3.5.2, groundwater (via aquifers) is the sole source of potable water for Accomack and Northampton counties; no major surface water sources are available for human consumption. These aquifers are the Columbia aquifer, an unconfined, water table aquifer lying between 2 to 18 m (5 to 60 ft) below ground surface, and the Yorktown-Eastover aquifers, a multi-unit system approximately 30 m (100 ft) below WFF. While these aquifers flow generally east and north, the unconfined Columbia is recharged from surface waters and infiltration, making it more susceptible to contaminants from the surface. An aquitard of silt and clay, between 6 to 9 m (20 to 30 ft) below ground surface, separates the Columbia from the Yorktown-Eastover aquifers. Similar aquitards also separate the three units, the upper, middle, and lower aquifers, of the Yorktown-Eastover with the lower unit, at about 90 m (300 ft) below WFF, containing the saltwater/freshwater interface. The Columbia and Yorktown-Eastover multi-aquifer system is recognized by the USEPA as sole-source aquifer and, therefore, protected from interference by contamination and excessive withdrawal rates. Wallops voluntarily complies with historic groundwater permits issued by VDEQ, limiting withdrawals to less than 58,000,000 liters (15,500,000 gallons) per year (NASA 2019a).

Seven groundwater wells supply potable water to WFF. Five wells are located on and serve the Main Base; two wells are located on the Mainland and serve both Wallops Island and the Mainland. While wells located in the unconfined Columbia aquifer may be contaminated by chemical plumes from previous activities on the surface, the five Main Base wells are in the Yorktown-Eastover aquifer at depths ranging from 30 m to 80 m (100 ft to 260 ft) below ground surface and are isolated from that contamination. NASA regularly tests the supply wells and contaminated wells are no longer used and replaced. NASA is working to restore contaminated groundwater to natural conditions (NASA 2019a, NASA 2020a).

The two Mainland wells supplying the Mainland and Wallops Island are also in the Yorktown-Eastover aquifer; withdrawing water at 60 m to 80 m (195 ft to 255 ft) below ground surface. Water for Wallops Island is pumped to three elevated tanks spaced along the island to provide sufficient water pressure. An additional elevated tank at Launch Pad 0-A stores water for sound and heat suppression during Pad 0-A launches. There are no groundwater wells on the 11 km (7 mi) long barrier island of Wallops Island (VCSFA 2016, NASA 2019a, NASA 2020a).

3.11.1.2 *Wastewater Treatment*

Wastewater is treated on the Main Base with a NASA-owned and operated wastewater treatment plant that has a capacity of 1,100,000 liters per day (300,000 gallons per day). From the Main Base, water is pumped through a force main to the collection system. From Wallops Island, water is pumped to one of five pump stations, through a 11 km (7 mi) force main, to the Main Base collection system, and the wastewater treatment plant. Treated wastewater is discharged through a solitary outfall (VA0024457) to an unnamed tributary to Little Mosquito Creek, a flat-mouthed, narrow creek influenced by freshwater discharge and tidal fluctuations (VDEQ 2016, NASA 2019a). Thirteen septic systems are maintained by WFF throughout the Main Base, Mainland, and Wallops Island, which are pumped biennially. Septic tank sludge is dried on the Main Base adjacent to the wastewater treatment plant and is disposed in the Accomack County North Landfill.

3.11.1.3 *Electric Power*

A&N Electric Cooperative (ANEC) distributes electricity to more than 35,000 members in Accomack and Northampton County, Virginia as well as Smith Island in Somerset County, Maryland. ANEC is a non-profit, member-owned cooperative with no outside investors (ANEC 2020). Two ANEC medium voltage feeders from the Wattsville substation feed the Main Base. Recent development activities about 8 km (5 mi) north in Captain's Cove, a housing development in Virginia situated along the Virginia-Maryland state line north of WFF, have resulted in a new substation reducing the load on the Wattsville Substation. The Main Base uses one of these medium power feeders as primary power, the second as backup power, and one 3-megawatt emergency generator as redundant backup power (ANEC 2020, NASA 2019a).

In 2020, NASA installed a 4.3 megawatt solar photovoltaic system along the southeasterly end of Runway 04-22 and solar photovoltaic carports in the parking area adjacent to Building F-006, both on the Main Base. These solar arrays allow WFF to address theNASA's energy and sustainability goals by generating clean, renewable energy from a technologically proven source. All solar power generated is consumed and offsets electricity requirements at the Main Base.

ANEC delivers power to the Mainland and to Wallops Island through a solitary transmission line from the Wattsville Substation to the Wallops Island Substation, where WFF is the primary consumer. Accomack County has buried some of the electric lines under Atlantic Road along the Wallops Space Transit Corridor. These lines connect to a pole outside the Wallops Island and Mainland gate, transitioning to an underground switching station at Building U-012. Backup power for the launch range and other mission critical infrastructure on the Mainland and on Wallops Island is provided from two 3 megawatt emergency generators and centrally managed in a control room in Building U-012 (NASA 2019a).

3.11.1.4 *Communication*

Commercial entities provide voice and data services for WFF Main Base, the Mainland, and Wallops Island. Communication lines are also buried along the Wallops Space Transit Corridor between the WFF Main Base and the Mainland (Accomack County 2020c, NASA 2019a, USN 2020). In 2020, NASA began the horizontal directional drilling installation of a second communication line connecting the Main Base to the west end of the north island UAS Airstrip. This second fiber optic cable will provide a redundant and reliable means of communications ensure the reliability of command, mission, voice, video, and data services for systems on Wallops Island. Additionally, the new fiber optic system will provide Wallops Island with a secure means of data transmittal with expanded capacity and enhanced transmission rates, as well as a system that is easily accessible for repair (NASA 2020a).

3.11.1.5 *Waste Collection and Disposal Services*

Accomack County Virginia does not provide residential curbside pickup. Waste collection and disposal are provided by private vendors. Accomack County provides numerous landfills, convenience centers, and recycling centers for county residents. Accomack and Northampton businesses may use the recycling centers. Commercial and construction solid waste from WFF may be taken to the North Accomack County Landfill or to the South Accomack County Landfill (Accomack County 2020a, Accomack County 2020b, Accomack County 2020c, NASA 2019a).

3.11.2 Environmental Consequences

Impact analysis for infrastructure and utilities compares the capacity against the projected demands of the Proposed Action and alternatives. Significant impact is concluded when the additional demands of the project preclude maintaining the existing level of service for existing customers.

3.11.2.1 *No Action Alternative*

Under the No Action Alternative, WFF would implement institutional support projects within the installation’s current envelope. Construction and demolition efforts under the installation’s current envelope have been covered by previous NEPA documents incorporated by reference into this tiered EA. No additional infrastructure or utility improvements would occur.

3.11.2.2 *Proposed Action: Phases 1, 2, and 3*

Under the Proposed Action, the new MARS Port pier would be constructed concurrently with associated infrastructure and channel dredging. Work would be completed in three phases as described in Chapter 2 with approximately 24 months of active work and 1 to 2 years between phases. Both temporary and long-term impacts to utilities would result. Proposed locations for onshore facilities and infrastructure are shown in **Figure 1-2**. It is assumed that construction of proposed onshore facilities and infrastructure would be completed during Phase 1 (although the North Island Operations Center may be constructed later).

During construction, utilities for new onshore facilities, including the new Project Support Building (former V-065 site) and the new second hangar (adjacent to the existing UAS Airstrip hangar) would be upgraded and expanded (**Figure 1-2**). In addition, new lighting meeting FAA airfield standards would be installed at the UAS Airstrip. Electricity, potable water, wastewater, and communications utilities would be extended to the Project Support Building from existing nearby infrastructure. Potable water would be supplied from the elevated north end tank (V-090) located adjacent to North Seawall Road, which has a 200,000-liter (50,000-gallon) capacity. Potable water supply piping would be placed in existing conduit extending from Building V-067 to the existing hangar at the UAS Airstrip. New conduit for electrical and communication utilities would be extended from the existing hangar to the proposed hangar at the UAS Airstrip. New utility conduit would also be installed along the new port access road to provide electrical and communication utilities to the pier. Wastewater from the hangars would be conveyed to a temporary above-ground holding tank located between the existing hangar and the proposed new hangar where it would be periodically collected and pumped for treatment into the NASA wastewater system.

Construction would impact utility infrastructure with short-term spikes in water and power demand along with wastewater treatment needs. Once constructed, increased operations of WFF would create a small increase in demands to the existing utility system. Construction of the MARS Port and operations area would potentially increase operational frequency and thereby increase demands upon utilities, contributing to the need to improve the aging infrastructure, which is operating beneath capacity. The expansion of the infrastructure on the north end of Wallops Island would accommodate the increased demand on utilities.

Water demands would fluctuate over time, but construction and operation of the Proposed Action should not impact overall water demands of WFF. Current operation for restroom services at the UAS Airfield is primarily temporary facilities (i.e., port-a-johns and/or mobile restroom trailers). These facilities are serviced by third-party companies and taken off island on a regular basis. These temporary facilities will be used during construction and will likely continue to be used after construction is completed. Therefore, operational needs for water resources are anticipated to be like current operational demands.

Given the current low demand to utilities and proposed improvements, both temporary and long-term impacts to the utility infrastructure would be considered minimal to beneficial.

Waste management SOPs would be developed employing BMPs for waste reduction and handling (see Section 4.2). While the Proposed Action would impact local landfills, the current infrastructure is operating beneath capacity and impacts would be considered minimal.

3.11.2.3 *Alternative 1: Phase 1 Only*

Under Alternative 1, impacts on utilities would be similar to those under the Proposed Action with the exception that the shorter pier would have fewer capabilities. Increased demand in utilities would be smaller than demands under Alternative 2 and under the Proposed Action. Likewise, minimal impacts to landfill capacity are anticipated.

3.11.2.4 *Alternative 2: Phases 1 and 2 Only*

Under Alternative 2, impacts on utilities would be similar to those under the Proposed Action with the exception that the shallower water depth would provide for fewer capabilities. Increased demand in utilities would be greater than demands under Alternative 1 and less than demands under the Proposed Action. Likewise, minimal impacts to landfill capacity are anticipated.

3.12 Recreation

Recreation resources include primarily outdoor recreational activities that occur away from a participant's residence. This includes natural resources and built facilities that are designated or available for public recreational use.

3.12.1 Affected Environment

There are no recreational areas open to the public or WFF employees and guests at or near the UAS Airstrip. There is one main area designated for recreational use on Wallops Island; it is a beach area on the east side of the island facing the Atlantic Ocean south of the proposed Project Area. 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.

There are recreational opportunities in the vicinity, including boating, paddling, fishing, and shellfish harvesting. Although waterways near Wallops Island are open to the public year-round for commercial and recreational fishing and boating, recreation primarily occurs in the warmer months of the year between spring and fall. The Virginia Seaside Water Trail, a water trail for day-use paddlers, runs between Chincoteague Island and the Eastern Shore of Virginia NWR at Cape Charles. The Virginia CZM Program funded development of the water trail for non-motorized use by paddlers using kayak or canoe, as well as several public access points (VDEQ 2019, Virginia Water Trails 2020).

The VMRC regulates aquaculture (shellfish harvest) in tidal waters, including recreational harvests by the public in areas designated as Baylor Grounds. Shellfish harvest grounds, which occur in some of the subaqueous bottom areas include private oyster grounds in Ballast Narrows and Chincoteague Channel and public clamming ground along the west side of Walker Marsh, north of Wallops Island (**Figure 3.7-1**).

3.12.2 Environmental Consequences

Impacts on recreation would be considered significant if a large portion of a particular type of recreation 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.

3.12.2.1 *No Action Alternative*

The No Action Alternative would have no impacts on recreation because the MARS Port and associated infrastructure would not be constructed or operated, and none of the associated construction activities with potential to affect recreation would occur.

3.12.2.2 *Proposed Action: Phases 1, 2, and 3*

Under the Proposed Action, there would be short-term, minor impacts on boaters and fisherman intermittently during dredging activities. Phase 1 and periodic maintenance dredging activities (turning basin and channel) would take approximately 30 days to complete; Phase 2 dredging (turning basin) would take approximately 7 days, and Phase 3 dredging (turning basin and channel) would take 30 days. Work would be performed 24 hours a day, seven days a week with two crews each working 12-hour shifts.

Fishing and boating traffic could be temporarily stopped or rerouted during ingress and egress of barges to and from the area. If appropriate, the USCG would issue NOTMARs, and the WFF Office of Communications would issue notices to warn boaters who may be in the vicinity of the activity to proceed with caution for the duration of construction activities. The presence of humans and anthropogenic noise are likely to scare away wildlife that is the focus of recreational viewers and hunters. Additionally, human presence and noise would temporarily alter the characteristic of the natural setting that would be expected by recreational users. Therefore, the presence of barges and the use of construction and trenching equipment could result in short-term, minor impacts on recreation. The public would be prohibited from accessing the work or staging areas while construction is ongoing.

3.12.2.3 *Alternative 1: Phase 1 Only*

Potential impacts on recreation would be similar but less than those described for the Proposed Action. Under Alternative 1, the fixed pier would only be constructed to a final length of 190 m (624 ft), which would result in a shorter construction duration.

3.12.2.4 *Alternative 2: Phases 1 and 2 Only*

Potential impacts on recreation would be similar but less than those described for the Proposed Action and only slightly greater than Alternative 1. Under Alternative 2, the fixed pier would be extended to a final length of 398 m (1,305 ft). The total amount of dredging would be less than under the Proposed Action and only slightly greater than Alternative 1.

3.13 Cultural 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. Archaeological resources are places where humans changed the ground surface or left artifacts or other physical remains (e.g., arrowheads or bottles).

The discussion of cultural resources in this EA is limited to archaeological resources because the Proposed Action would have no potential to affect architectural resources near the Project Area. Additionally, WFF does not possess or manage Native American collections or cultural items, Native American remains, or Native American sacred sites or traditional cultural properties. The facility is not located within the lands of any state or federally recognized Native American tribe (NASA 2015b). Therefore, traditional cultural resources are not addressed in this EA.

Section 106 of the National Historic Preservation Action of 1966 (NHPA), as amended, requires federal agencies to consider the effects of their actions on historic properties that are listed or eligible for listing in the National Register of Historic Places (NRHP). The NRHP administered by the National Park Service, is the official inventory of cultural resources including National Historic Landmarks.

In consideration of 36 CFR 800, federal agencies are required to initiate consultation with the State Historic Preservation Office (SHPO) informing them of the planned action and requesting their comments or concerns. As described in Section 3.18 of the *Final Site-wide PEIS*, in accordance with Sections 106 and 110 of the NHPA, NASA developed a Programmatic Agreement with the Virginia SHPO and the President's Advisory Council on Historic Preservation to outline how WFF manages its cultural resources as an integral part of its operations and missions (NASA 2014b, NASA 2015b). As part of this process, NASA identified parties who have an interest in, or knowledge of, cultural resources at WFF and included them in the development of the terms of the Programmatic Agreement. The Programmatic Agreement establishes the parameters for managing cultural resources at WFF including:

- Roles and responsibilities,
- Updates and requirements for the WFF Integrated Cultural Resources Management Plan,
- Activities not requiring review,
- Review process for potential impacts including professional qualifications, documentation, curation, etc.,
- Requirements for the treatment of the Wallops Beach Lifesaving Station,
- Resolution of adverse effects and disputes, and
- Emergency actions.

3.13.1 Affected Environment

The affected environment for archaeological resources consists of the areas where ground (including underwater substrate) disturbance would occur in association with construction and operational activities, which are collectively referred to as the Area of Potential Effect (APE).

In 2003, NASA modeled all property within WFF's boundaries for the potential of archaeological resources (NASA 2003). According to NASA's predictive model for prehistoric and historic archaeological sites (which applies only to NASA's lands, including the UAS Airstrip), the APE at the UAS Airstrip site falls within the area of high archaeological potential (NASA 2003). During the NEPA analysis for the construction and operation of the UAS Airstrip, NASA performed a Phase I archaeological survey which did not result in identification of archaeological resources with potential to extend into the UAS Airstrip APE (Espenshade and Lockerman 2009). Moreover, the entire APE near the UAS Airstrip has been previously disturbed during construction of the airstrip.

No previously recorded archaeological resources are located within the APE. A review of the Virginia Cultural Resource Information System (V-CRIS) identified two archaeological sites, Virginia 44AC0459 and 44AC0089, within a half-mile radius of the APE. Site 44AC0459 located 1.2 km (0.75 mi) south of the APE, is a terrestrial archaeological site, with mixed context artifacts from the mid-18th through 20th centuries. The artifacts are associated with the old Coast Guard Station trash disposal patterns and mid-to-late 20th century NASA activities. Site 44AC0089 is a terrestrial earthwork dating to the Revolutionary War and located approximately 60 m (200 ft) northeast of the proposed project APE at the UAS Airstrip. Neither of these sites are within the proposed project's APE.

In February 2021, NASA conducted a Phase I archaeological survey of the terrestrial portions of the proposed Project Area which had not been previously surveyed. The APE consists of approximately 0.25 ha (0.61 ac) area located on the southwest side of the southeastern terminus of the existing airstrip. The pedestrian survey identified no surface features. Fifteen Shovel Test Pits were excavated within the project APE; no artifacts were recovered, and no subsurface features were identified. No further archaeological investigation was recommended (Furgerson and Johnson 2021).

Although the V-CRIS review and Phase I archaeological survey did not identify potential archaeological resources at or near the Wallops Island Northern Development APE, this area has the potential for maritime resources and/or buried prehistoric resources, with no archaeological potential at or near the surface. Review of nineteenth and early twentieth-century nautical charts and historic maps, however, did not reveal the potential for significant shipwrecks or potentially submerged maritime industry resources. Given the local shallow marsh conditions it was expected no potential sites would be revealed. To confirm this assumption, AECOM archaeologists conducted a Phase I marine archaeological survey in July 2020 and in February 2021, for this Proposed Action. The marine survey was conducted over the entirety of the proposed channel, turning basin, and pier, the underwater APE. The nautical archaeology survey used nonintrusive geophysical instruments including a side scan sonar, a marine magnetometer, and a single-beam sonar (bathymetric echosounder) while archaeologists investigated the marsh as a pedestrian survey with a terrestrial magnetometer. The 2020 and 2021 survey results produced 165 magnetic and 26 acoustic contacts that resulted in clusters of 23 spatially modeled targets. Archaeologists also analyzed magnetic contour, acoustic, landform, and local infrastructure patterns independent of the spatially modeled targets to identify any additional geophysical signatures that may be indicative of archaeological patterning. The targets were all associated with isolated debris, marking stakes, or fishing activities. No potentially significant submerged archaeological resources were identified within the marine APE. No additional archaeological investigations were recommended of any of the submerged anomalies recorded during this survey (Cartellone and Pelletier 2020).

3.13.2 Environmental Consequences

Impacts on archaeological resources would be significant if a measurable effect could not be resolved through the Section 106 consultation process.

3.13.2.1 *No Action Alternative*

The No Action Alternative would have no impacts on archaeological resources because the Proposed Action would not be implemented, and no construction activities with potential to affect archaeological resources would occur.

3.13.2.2 *Proposed Action: Phases 1, 2, and 3*

The results of a V-CRIS search did not indicate the presence of known archaeological resources within the proposed project APE. The results of Phase I surveys for archaeological resources within the terrestrial project APE in 2009 and 2021 were negative for artifacts, features, or cultural deposits. The airstrip separates Site 44AC0089 from the current project APE. NASA would ensure that all proposed project activities would remain outside the protective fencing surrounding Site 44AC0089. The results of the 2020 and 2021 marine archaeological surveys did not identify any potentially significant submerged archaeological resources within the marine APE. Therefore, the Proposed Action would have no potential to effect known terrestrial or marine historic resources.

In the case of inadvertent discovery of human or ancestral remains and/or cultural resources during construction, the WFF Cultural Resources Manager would immediately halt activities and notify the appropriate Tribal governments; the Virginia Department of Historic Resources (VDHR); and, for remains, the coroner and local law enforcement, as to the treatment of the remains and/or archaeological resources (see Section 4.2). NASA WFF personnel would make all reasonable efforts to avoid disturbing any gravesites including those containing Native American human remains and associated funerary artifacts. All human remains would be treated in a manner consistent with Section XIII Human Remains of the *WFF Programmatic Agreement for Management of Facilities, Infrastructure, and Sites* (NASA 2014b, NASA 2015b).

In accordance with Section 106 of the NHPA, NASA submitted consultation to the VDHR, the SHPO for the Commonwealth of Virginia, through its ePIX system on 8 September 2021, stating its determination that there would be no historic properties affected by the Proposed Action. VDHR responded in a memorandum dated 15 October 2021, that the undertaking will have No Adverse Effect on historic properties. NASA also submitted consultation to the Catawba Indian Nation, Chickahominy Indian Tribe, and Pamunkey Indian Tribe via email on 10 September 2021. No response has been received from any of the tribes to date. Copies of all correspondence between NASA, VDHR, and Tribes are included in **Appendix F,** *Cultural Resources*.

3.13.2.3 *Alternative 1: Phase 1 Only*

Potential impacts of Alternative 1 to archaeological resources would be the same as those described for the Proposed Action.

3.13.2.4 *Alternative 2: Phases 1 and 2 Only*

Potential impacts of Alternative 2 to archaeological resources would be the same as those described for the Proposed Action.

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4 Permits, Mitigation and Monitoring

As defined in the CEQ regulations (40 CFR 1508.20) mitigation includes: 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. Section 4.1 provides a summary of proposed permits NASA would secure prior to implementing the Proposed Action as well as those existing and project-specific plans that would be followed during implementation of the Proposed Action.

Once implementation of a Proposed Action is underway, a federal agency has a responsibility to continually monitor that implementation to ensure that mitigation or other protective measures are being employed. Section 4.2 provides a summary of NASA's proposed mitigation and monitoring of various resource areas during and after implementation of the Proposed Action.

4.1 Summary of Permits and Plans Required

NASA, VCSFA, and VCSFA contractors would need to obtain the following permits and concurrence prior to starting work on the Wallops Island Northern Development project:

- Accomack County Wetlands Board Permit
- VMRC Tidal Wetlands and Subaqueous Bottom Permits
- VDEQ CWA Section 401, Water Quality Certification/Water Protection Permit
- VDEQ Coastal Zone Management Act Consistency Determination
- NOAA Fisheries ESA Section 7 Biological Opinion/Letter of Concurrence
- NOAA Fisheries EFH Letter of Concurrence
- USACE CWA Section 404 Dredge and Fill Permit
- USACE CWA Section 408 Authorization to Use or Alter a Federal Civil Works Project
- USACE Rivers and Harbors Act Section 10, Navigable Waters Permit
- USACE Marine Protection, Research, and Sanctuaries Act Section 103, Ocean Dumping Permit for Dredged Material (this permit only applies if Dredged Material Placement Site Option 1 is selected)
- USFWS ESA Section 7 Biological Opinion/Letter of Concurrence

Additionally, the following plans would be implemented prior to starting work on the Wallops Island Northern Development project:

- WFF ICP
- Project-specific SWPPP
- ESC and stormwater best practices
- WFF Phragmites Control Plan
- Wallops Island Sea Turtle Lighting Plan
- Revolutionary War Earthworks Maintenance Plan

4.2 BMPs, Mitigation and Monitoring

Table 4-1 shows the BMPs, mitigation measures, and monitoring by resource area that NASA, VCSFA, and VCSFA's contractor propose to conduct to avoid and/or minimize impacts, to the greatest extent practicable.

Table 4 1. Summary of BMPs, Mitigation and Monitoring Measures

Resource Area	Measures
Noise	• Construction activities associated with institutional support projects may be limited to normal daytime working hours except for certain activities (e.g., continuous dredging operation). • Temporary fencing would be placed around active upland construction zones to create buffer around the area and ensure that non-construction/demolition personnel would not be exposed to unsafe noise levels. • Time of year restrictions for pile driving activities could be employed to reduce impacts on spawning marine animals or nesting seabirds, if required by NOAA Fisheries or USFWS. • Pile driving associated with construction of the pier may require the use of mitigation measures (e.g., bubble curtains, use of a soft-start procedure) to minimize underwater noise impacts.
Munitions and Explosives of Concern	• A munition response plan would be developed. • Trained UXO Technician would be available during geophysical survey of construction areas and/or during construction.
Health and Safety	• Safety Plans would be prepared, implemented, and followed. • If applicable, contractors would follow regulations defined in Federal Acquisition Regulation 52.236-13, Accident Prevention.
Land Resources	• SWPPP, ESC, and stormwater management BMPs could include using silt fencing; soil stabilization blankets; and matting construction entrances, material laydown areas, and around areas of land disturbance during construction. Bare soils would be vegetated after construction to reduce erosion and stormwater runoff velocities. • WFF ICP would be implemented and followed to prevent or swiftly respond to petroleum or chemical spills or releases. • Heavy equipment, located in temporarily impacted wetland areas, would be placed on mats, geotextile fabric, or other suitable measures to minimize soil disturbance to the maximum extent practicable.

Table 4 1. Summary of BMPs, Mitigation and Monitoring Measures

Resource Area	Measures

Water Resources	• Machinery and construction vehicles would be operated outside of streambeds and wetlands to the greatest extent practicable; synthetic mats, low-pressure tires, and/or other best practices may be used when in-stream work or wetland work is unavoidable.
	• The top 30 cm (12 in) of material removed from wetlands would be preserved for use as wetland seed and rootstock in the excavated area unless the material contains phragmites.
	• ESC would be designed in accordance with the most current edition of the Virginia Erosion and Sediment Control Handbook. Controls would be in place prior to clearing and grading and maintained in good working order to minimize impacts to state waters. The controls would remain in place until the area stabilizes.
	• WFF ICP and project specific SWPPP would be implemented to reduce impacts of stormwater runoff, potential groundwater contamination, and fueling and maintenance of vehicles and equipment.
	• A JPA package would be prepared and submitted to USACE containing various minimization and/or mitigation measures to address potential adverse impacts:
	  ◦ Wetland ground and vegetation disturbance would be returned to pre-construction conditions, in accordance with permit requirements.
	  ◦ Dredging would maintain buffers of a minimum of twice the dredge cut from nonvegetated tidal wetlands and four times the dredge cut from vegetated tidal wetlands.
	  ◦ Permanent wetland impacts and loss of shallow water habitat would be compensated for in accordance with the USACE/USEPA 2008 Compensatory Mitigation Rule.
	  ◦ Monitoring of wetlands, streambeds, channels, etc. in construction areas would occur in accordance with all project permits.
	• In accordance with Section 438 of the Energy Independence and Security Act of 2007, low impact development measures would be incorporated to the maximum extent feasible to manage and minimize stormwater runoff onsite.
	• Sediment curtains would be used, if necessary, for open water work on the pier and during dredging activities.
	• Dredging rate could be reduced to slow down the dredging operation, especially bucket speed when approaching the sediment surface and bucket removal from the surface after closing.
	• Bucket over-penetration could be reduced to minimize or eliminate sediment from be expelled from the bucket vents and/or piling on top of the bucket and eroding during bucket retrieval.
	• Overflow from barges during dredging or transport could be eliminated.
	• Dredge operation methods would change based on site conditions such as tides, waves, currents, and wind.
	• Descent or hoist speed of a wire-supported bucket could be modified.
	• Dredging could be sequenced by moving upstream to downstream.
	• Number of dredging passes (vertical cuts) could vary to increase sediment capture.
	• Properly sized tugs and support equipment would be used.
	• GPS location technology would be used on dredging equipment to avoid over dredge.

Table 4 1. Summary of BMPs, Mitigation and Monitoring Measures	
Resource Area	**Measures**
Vegetation	• Construction and post-construction monitoring would be conducted to identify and document if and when disturbed areas achieve final stabilization as specified in any permits; corrective action measures would be implemented such that permit requirements are met. • Vegetation suveys or inventories would be conducted to assess the potential presence of *E. maritimum* and the dune maritime woodlands community. Adverse impacts to this species and community would be avoided to the maximum extent practicable. • Temporarily disturbed areas would be replanted with native species in accordance with NASA WFF vegetation management policies or returned to a permeable condition. • Vegetation maintenance would be conducted periodically, as necessary. • Mitigation of invasive species (e.g., *Phragmites*) would occur in accordance with the *WFF Phragmites Control Plan*.
Wildlife and Special Status Species	• All terms and conditions included in the 2019 BO would be complied with. • Implementation of time-of-day and/or seasonal restrictions of land and water-based construction to mitigate impacts to special-status species may occur. Specifically, time-of-year tree clearing restrictions would be complied with from April 1 to November 14, and restrictions on Phase 1 dredge material beach placement from March 15 to August 31, or to November 30 if a sea turtle nest is discovered. • Construction techniques such as vibratory dampening and the use of lighting methods (e.g., including incorporating downward pointing and/or low-glare lighting) would be used to minimize potential effects on eastern black rail during pier construction. • Special-status species (e.g., eastern black rail) habitat would be revegetated and restored, if necessary. • NOAA Fisheries and Commonwealth of Virginia dredging guidelines would be followed. Dredging activity may also be subject to time-of-day and seasonal restrictions and/or qualified observers. • Monitoring and exclusion zones would be established around activities (e.g., pier construction, dredging) that could cause injury to marine mammals. • Onboard observers would be present during pile driving and dredging activities, and all activity may be temporarily suspended if a threatened or endangered species is identified in the vicinity of pile-driving activities. • Sediment curtains could be utilized during dredging and pier construction, if necessary. • Bubble curtains could be utilized for noise attenuation during pile driving. • Impact hammer 'soft-start' procedure would use reduced hammer energy and noise when installing 24-inch square, pre-stressed concrete piles during pier construction. • To protect shellfish beds, dredging would be conducted during slack tides (i.e., on the western portion of the channel during flood tides and the eastern portion during ebb tides). • Restrictions may be placed on the number of trips taken by each vessel and shallow-draft vessels may be used for water-related activities under the Proposed Action. • Vessels would operate at idle/no wake speeds in project construction areas, in shallow depths, and in all depths after a marine mammal has been observed. • Vessels in transit to or from the proposed pier would comply with NOAA Fisheries rules and regulations regarding reducing speeds to protect North Atlantic right whales. • Monitoring would adhere to and be consistent with the ICP; SWPPP; Spill Prevention, Control, and Countermeasure Plan; and other applicable permits and plans.

Table 4 1. Summary of BMPs, Mitigation and Monitoring Measures

Resource Area	Measures
Essential Fish Habitat	• Measures may be implemented to ensure no net loss of EFH due to construction activity. • NOAA Fisheries and Commonwealth of Virginia dredging guidelines would be followed. Dredging activity may also be subject to time of day and seasonal restrictions. • All dredging would be conducted during stages of the tide that allows the sandy dredge material to settle quickly from the water column; e.g., slack tide or when tidal currents will carry resuspended sediment away from shellfish resources. • In locations where dredging during slack tide is not practical, other means would be employed to reduce turbidity moving away from the dredge such as turbidity curtains or operational BMPs (i.e., reduced bucket ascent rates) to help protect shellfish resources. • Impact hammer 'soft-start' procedure would use reduced hammer energy when installing 24-inch square, pre-stressed concrete piles during pier construction. • All Phase 1 beach-quality, sandy dredge material would be placed at the North Wallops Island beach borrow area for beneficial use as proposed. • Every effort would be made to coordinate Phase 2 and Phase 3 dredging operations with ongoing WFF shoreline renourishment actions; however, the ability to do so would be contingent on the availability of funding for each phase of the proposed project. • NASA and VCSFA would compensate for 1,500 m^2 (0.37 ac) of tidal wetland (permanent) impacts in accordance with the USACE/USEPA 2008 Compensatory Mitigation Rule as proposed. • 0.66 ha (1.64 ac) of tidal wetland (temporary) impacts would be restored to pre-construction conditions and revegetated, if necessary. Wetland revegetation would be monitored to ensure successful restoration of these areas.
Transportation	• All transportation activities, including road closures, traffic control, safety issues, etc. would be coordinated with Accomack County and VDOT Accomack Residency Office. • Coordination with USCG would occur for any required waterway closures during dredging and dredged material placement operations. • Notices to Mariners would be issued for all in-water work and in-water signage of construction area would be posted.
Infrastructure and Utilities	• Waste management SOPs would be developed for waste reduction and handling.
Recreation	• NOTMARs would be issued by the USCG, and the WFF Office of Communications would issue notices to warn boaters who may be in the vicinity of the activity to proceed with caution for the duration of construction activities.
Archaeological Resources	• Work would halt and WFF Historic Preservation Officer would be contacted immediately if cultural resources are discovered during ground disturbing activities.

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5 Cumulative Effects

The CEQ (40 CFR 1508.7) defines cumulative effects as the "impact on the environment which results from the incremental impact of the action(s) when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions."

Section 5.4 of the *Final Site-wide PEIS* provides a detailed Cumulative Effects Analysis (CEA) for all potentially affected resource areas, with temporal range spanning from the mid-1940s (when a federal presence started on the Main Base and Wallops Island) through 2039, which accounts for the *Final Site-wide PEIS* 20-year planning horizon starting with the year 2019. The geographic scope of this CEA includes the proposed area (north end of Wallops Island, UAS Airstrip, Chincoteague Channel, Hammock Point, and Ballast Narrows) and the resources near WFF and the USFWS Chincoteague NWR.

The *Final Site-wide PEIS* CEA is incorporated by reference. The actions included in the past, present, and reasonably foreseeable future actions section of the *Final Site-wide PEIS* CEA are comprehensive and cover all but two actions that also warrant consideration in the CEA for this tiered EA. The two additional projects not discussed in the *Final Site-wide PEIS* CEA that warrant consideration in this CEA are the Wallops Island SERP (NASA 2019c) and the Marsh Fiber Project (NASA 2020a). The purpose of the SERP Project is to restore the Wallops Island shoreline infrastructure protection area to reduce the potential for damage to, or loss of, assets on Wallops Island from wave impacts associated with storm events. The SERP EA was tiered off the 2010 Shoreline Restoration and Infrastructure Protection Program PEIS (NASA 2010b) and was described in the *Final Site-wide PEIS* CEA. The Marsh Fiber Project involves the installation of a new fiber optic cable between a WFF handhole on the USFWS Wallops Island NWR (near the WFF Main Base) and the UAS Airstrip on Wallops Island. Installation involves two Maxi Horizontal Directional Drilling segments, vibratory trenching across Walker Marsh, and Mini Horizontal Directional Drilling across three guts in Walker Marsh (NASA 2020a). The Marsh Fiber EA was tiered off the *Final Site-wide PEIS*.

Therefore, this CEA includes six relevant actions: four actions that were described in the *Final Site-wide PEIS*, and other relevant tiered EAs that apply to this CEA include the following:

- NASA Activities:
  - Wallops Island Shoreline Restoration and Infrastructure Protection Program (periodic beach renourishment, approximately every 5 years) (NASA 2010b; also described in *Final Site-wide PEIS)*
  - Wallops Island Shoreline Enhancement and Restoration Project (NASA 2019a)
  - Expansion of the Wallops Island Launch Range (including Launch Pad 0-C and/or Launch Pier 0-D) (see *Final Site-wide PEIS)*
  - Phragmites Control and Monitoring Program (see *Final Site-wide PEIS)*

  - Replacement of Causeway Bridge (see *Final Site-wide PEIS)*
  - Marsh Fiber Project (installation of an underground fiber optic cable between Wallops Main Base and Wallops Island) (NASA 2020a)
- Other:
  - U.S. Navy operations at Wallops Island and the Atlantic Ocean (e.g., Atlantic Fleet Training and Testing [AFTT]) (see *Final Site-wide PEIS)*
  - U.S. Air Force Instrumentation Tower (see *Final Site-wide PEIS)*
  - USACE Federal Navigation Projects (dredging of Bogues Bay and Chincoteague Inlet) (see *Final Site-wide PEIS)*
  - Accomack County Subdivision Development within the Vicinity of WFF (see *Final Site-wide PEIS)*
  - Ongoing commercial, recreational, and military vessel traffic in the area between Wallops Island and the mainland, including anchoring (see *Final Site-wide PEIS)*

5.1 Potential Cumulative Effects by Resource

As noted in Section 5.4 of the *Final Site-wide PEIS*, the scope of the CEA is related to the magnitude of the environmental impacts of the Proposed Action. The following section addresses those resources that have been identified as having the potential to be affected from the incremental effects of the Proposed Action in combination with past, present, and reasonably foreseeable future activities. Only those resource areas upon which the Proposed Action would cause measurable effects are considered in detail in this CEA. The term negligible, as used in this NEPA analysis, refers to impacts that would be so small that when studying the larger effect, the impacts would be imperceptible.

Table 5-1 provides a summary of those resources considered and whether they were included for detailed analysis in this CEA.

Table 5 1. Summary of Potential Environmental Impacts

Resource	EA Section	Type of Impact from the Proposed Action	Analyzed in CEA?
Noise	3.1	Airborne noise from construction activities would be minor, short-term, and localized. Underwater noise from construction and dredging would be short-term, temporary, and would not have effects on wildlife beyond the immediate vicinity. Incremental contributions to cumulative noise impacts would be negligible.	No
Munitions and Explosives of Concern	3.2	No cumulative effects anticipated.	No
Health and Safety	3.3	No cumulative effects anticipated.	No

Table 5 1. Summary of Potential Environmental Impacts

Resource	EA Section	Type of Impact from the Proposed Action	Analyzed in CEA?
Land Resources	3.5	Short-term impacts from ground disturbances. Site-specific Erosion and Sediment Control Plans and BMPs would be implemented to reduce erosion and stormwater runoff. Cumulative impacts would be negligible.	No
Surface Waters and Stormwater Management	3.6.1	Project would implement WFF ICP, ESC BMPs, and SWPPP; short-term minor impacts would occur from turbidity and erosion during construction and dredging.	Yes
Groundwater	3.6.2	Short-term minor impacts from dewatering and additional potable water usage; no cumulative effects anticipated.	No
Wetlands	3.6.3	Short-term indirect and direct impacts from the Proposed Action; with wetland mitigation measures, cumulative impacts would be minor in the short-term and negligible in the long-term.	Yes
Floodplains	3.6.4	No impacts from the Proposed Action.	No
Coastal Zone	3.6.5	Project would be consistent to the maximum extent practicable with the enforceable policies of Virginia's CZM Program; no cumulative effects anticipated.	No
Sea Level Rise	3.6.6	No potential to contribute to sea-level rise; negligible impacts from sea-level rise on new infrastructure that would be constructed by the Proposed Action.	No
Vegetation	3.7	Short-term adverse impacts from removal of vegetation and disturbances; impacts would be minimized with use of synthetic matting and mitigated by replanting where vegetation would be disturbed. Permanent loss of vegetation in areas of facility installation would negligibly contribute to cumulative vegetation loss in the region.	Yes
Wildlife	3.8	Short-term minor impacts from disturbances during construction activities on terrestrial and aquatic species (e.g., noise, habitat impacts, turbidity), but wildlife would not experience cumulative, long-term impacts as they currently reside in an area dominated by WFF operations.	Yes
Essential Fish Habitat	3.9	Loss of habitat within the footprint of the proposed pier and temporary removal of substrate in channels and turning basins by dredging would have negligible incremental impacts on relatively small areas of EFH.	Yes
Special Status Species	3.10	With implementation of BMPs, federally threatened or endangered status species may be affected but would not likely be adversely affected by project-related effects in conjunction with other activities in the action area. Temporary, incremental impacts on marine mammals would be minimal and less than significant.	Yes

Table 5 1. Summary of Potential Environmental Impacts

Resource	EA Section	Type of Impact from the Proposed Action	Analyzed in CEA?
Transportation	3.11	Minor short-term impacts to traffic flow when large vehicles and heavy equipment make deliveries to the Project Area. Minor short-term impacts from presence of boats and barges during construction (12 months for Phase 1; 9.5 months for Phase 2) and dredging (30 days for Phase 1; 7 days for Phase 2, 30 days for Phase 3). Waterway closures or implementation of a safety lane may be required during transportation of large and heavy equipment to the Project Area. Long-term beneficial impacts to traffic safety from new port because it would allow oversized equipment and potentially hazardous vehicles to be delivered directly to Wallops Island by sea and remove a portion of the heavy loads that stress existing roads and the Wallops Island causeway bridge.	Yes
Infrastructure and Utilities	3.11	Long-term beneficial impacts from new port and operations area and enhanced operational capabilities	Yes
Recreation	3.12	Minor short-term impacts to boaters and fisherman would occur from Proposed Action; cumulative impacts would be negligible.	No
Archaeological Resources	3.13	No cumulative effects to historic properties from the Proposed Action.	No

5.1.1 Surface Waters

Past and projected construction activities in the areas surrounding the Proposed Action including grading, clearing, filling, and excavation would result in disturbance of the ground surface and would have the potential to cause soil erosion and the subsequent transport of sediment and/or nutrients into waterways via stormwater. Construction of the proposed second hangar and the vehicle parking lot for the MARS Port would also increase surface water runoff. NASA has and would continue to minimize impacts on surface waters by acquiring necessary permits and by developing and implementing the WFF ICP along with site-specific SWPPPs and ESC plans prior to land-disturbing activities. NASA would follow VSMP requirements for proper sizing and planning for stormwater conveyance from new infrastructure.

Other projects occurring in adjacent estuarine and marine waters (i.e., Marsh Fiber Project, USACE Federal Navigation Projects, Navy AFTT) would result in temporary elevated levels of turbidity, particularly for projects in the northern end of Wallops Island. However, these projects would be temporally and spatially separated and would result in negligible cumulative water quality impacts. As such, there would be no significant cumulative impacts to surface water resources from implementing the Proposed Action.

5.1.2 Vegetation and Wetlands

The Proposed Action would result in temporary and permanent impacts to estuarine emergent and tidal vegetated wetlands. NASA and VCSFA would restore temporarily impacted wetlands to pre-construction contours and revegetate. Consistent with the CWA mitigation final rule, NASA and

VCSFA would compensate for permanent impacts to wetlands through wetland mitigation credit purchase, wetland creation, wetland restoration, wetland enhancement, and/or acquisition of wetland credits through an in-lieu fee fund such as the Virginia Aquatic Resources Trust Fund.

Impacts to wetlands would be permitted through the USACE, VMRC, VDEQ, and Accomack County to ensure no net loss of wetlands. As described in the *Final Site-wide PEIS*, unavoidable adverse impacts to wetlands have occurred cumulatively over time at WFF. Current and reasonably foreseeable future projects (i.e., Shoreline Restoration, Expansion of the Launch Range, Phragmites Control and Management, Marsh Fiber Project, and U.S. Air Force Instrumentation Tower), have and could continue to impact wetlands on Wallops Island. Appropriate mitigation is determined at the time of permitting, and it is often the case that the ratio of wetlands mitigation to wetlands loss is greater than 1:1. Therefore, the Proposed Action would not result in a net loss of wetlands or contribute significant cumulative impact to wetlands.

5.1.3 Wildlife

During construction, elevated airborne noise levels may startle wildlife in the vicinity of the Project Area. Temporary increases in noise are anticipated because of current and planned projects in the CEA area, as noted in this CEA and Section 5.4.5 of the *Final Site-wide PEIS*. Avian foraging and nesting activities would be temporarily affected by the Proposed Action. Past, present and reasonably foreseeable activities at the UAS Airstrip, navigation channel dredging west of Wallops Island, shoreline restoration construction, etc. can also temporarily affect avian foraging and/or nesting through noise and human presence. Noise generated from rocket launches is generally low frequency, of short duration, and occurs infrequently.

Airborne noise associated with motorized watercraft (e.g., commercial fishing boats, recreational vessels, and Navy ships) has the potential to startle birds that may initiate a temporary flight response. Rodgers and Schwikert (2002) reported average flush distances for water birds ranging between approximately 20 and 60 m (65 to 200 ft) from the vessel, depending upon species. Vessel traffic in the CEA area is not projected as heavy, the stimulus would be temporary, and it is expected that avian activity would quickly return to normal, following vessel's passage.

Underwater noise from construction and dredging would potentially affect fish and wildlife, if present nearby while these activities are occurring. Impacts from underwater noise would be short-term, temporary, and would not injure or have behavioral effects on wildlife beyond the immediate vicinity. Incremental contributions of underwater project-related noise to cumulative noise impacts would be negligible.

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 launches, pile driving for pier construction, dredging, and other human activities. In summary, no long-term changes to ambient noise levels are anticipated and the Proposed Action would not contribute significantly to cumulative impacts on wildlife.

5.1.4 Essential Fish Habitat

Future activities in marine waters such as dredging, commercial fishing using bottom-disturbing methods, anchoring of boats/barges/ships, construction of marinas and docks, etc. would result in temporary adverse changes to water quality (primarily from increased turbidity), and would have the potential to result in direct and indirect cumulative impacts on EFH, fish, and shellfish.

Activities that would occur in state waters surrounding Wallops Island would require permitting from various agencies (e.g., NOAA Fisheries, USACE, VMRC, Accomack County). Activities not related to the Proposed Action that would have the potential to temporarily or permanently affect EFH, fish, and/or prevent harvest of aquaculture species in leased areas or public grounds would require notification to VMRC and subsequent permitting, as applicable. Permits would include measures to avoid adverse impacts to EFH, fish, and aquaculture sites such that cumulative actions would not affect the long-term viability of EFH, fish, or public or private oyster grounds near these areas. As a result, construction of the pier and dredging of shipping channels and turning basins under the Proposed Action would have minimal impacts on EFH in the Project Area; the contribution to cumulative impacts on EFH in the region would be insignificant.

5.1.5 Special Status Species

As discussed for other wildlife, elevated airborne noise levels may startle listed bird species in the vicinity of ongoing construction activities. Temporary increases in noise are anticipated because of current and planned projects in the CEA area, as noted in this CEA and Section 5.4.6 of the *Final Site-wide PEIS*. Avian foraging and nesting activities would be temporarily affected by the Proposed Action. Past, present and reasonably foreseeable activities at the UAS Airstrip, navigation channel dredging west of Wallops Island, shoreline restoration activities, etc. can also temporarily affect foraging and/or nesting of special-status avian species through noise and human presence. For all projects in the CEA area, avoidance and minimization measures would be implemented by NASA, VCSFA, and their contractors during construction, and habitats (e.g., potentially suitable wetland habitat for eastern black rail) would be revegetated and restored if necessary.

Noise generated from rocket launches is generally low frequency, of short duration, and occurs infrequently. Airborne noise associated with motorized watercraft (e.g., commercial fishing boats, recreational vessels, and Navy ships) has the potential to startle birds and may initiate a temporary flight response. However, vessel traffic in the CEA area is not projected as heavy, the stimulus would be temporary, and it is expected that avian activity would return to normal shortly following vessel passage.

Underwater noise from construction and dredging would potentially affect special status fish (Atlantic sturgeon, giant manta ray) and wildlife (sea turtles) if present nearby during the times when these activities are occurring. Impacts from underwater noise would be short-term, temporary, would not cause injury, and would not have behavioral effects on special-status species beyond the immediate vicinity. Incremental contributions of underwater project-related noise to cumulative noise impacts on special-status species would be negligible.

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, pile driving for pier construction, dredging, and other human activities. In summary, no long-term changes to ambient, noise levels are anticipated, and the Proposed Action would not contribute significantly to cumulative impacts on special status species.

5.1.6 Traffic and Transportation

There is potential for the Proposed Action to result in impacts to both truck and vessel traffic. The impacts to truck traffic would generally be beneficial, as the implementation of the Proposed Action would reduce long haul truck trips, lower the volume of hazardous and oversized vehicles, and alleviate some traffic congestion on highway corridors. Conversely, by removing trucks from the highway corridors, vessel trips would be expected to increase by an estimated range of two to four vessel trips (one to two trips each way) for each of the conceptual Marine Highway services.

Types of other actions that would result in either positive or negative impacts to traffic and transportation include increases in barge and research vehicle traffic, as well as increases or decreases in vehicular traffic. Cumulative impacts to traffic and transportation of the Proposed Action when considered with these types of projects may potentially be additive or offsetting depending on whether they would result in increased vessel trips or increased truck trips. Overall, the reduction in truck traffic is anticipated to be greater than the increase in vessel traffic. As shown in **Table 2-3**, the vessel quantity assumptions include multiple trucks per vessel. Additionally, operations and usage of the Proposed Action would start slowly and gradually increase as the launch frequency and cadence increases at the WFF.

5.1.7 Infrastructure and Utilities

The Proposed Action would have long-term beneficial impacts on infrastructure and utilities by improving aging and inadequate infrastructure (new facilities and access road, runway, and utilities improvements) at WFF. When combined with the actions described in Section 5.4 of the *Final Site-Wide PEIS*, Marsh Fiber EA, and the SERP EA, there would be a long-term beneficial impact on infrastructure and utilities at Wallops. Cumulatively, the Proposed Action would have long-term beneficial impacts on the mission of NASA and its tenants at WFF.

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6 Agencies and Persons Consulted

Copies of the Draft EA were sent to the following agencies, organizations, and individuals.

Table 6 1. List of Agencies and Persons Consulted for the EA

Name	Organization	Letter	Draft EA
Federal Agencies			
Ms. Kristine Gilson	Maritime Administration	✓	✓
Ms. Erin Kendle	Maritime Administration	✓	✓
Mr. Brian Denson	USACE, Eastern Shore Field Office	✓	✓
Mr. Brian Hooper	NMFS, Protected Resources Division	✓	✓
Mr. David O'Brien	NMFS, Habitat Conservation Division	✓	✓
Ms. Kimberly Damon-Randall	NMFS, Protected Resources Division	✓	✓
Ms. Karen Green	NMFS, Essential Fish Habitat Division	✓	✓
Mr. Victor Grycenkov	NOAA, Wallops Command and Data Acquisition Station	✓	✓
Ms. Deborah Darden	NPS, Assateague Island National Seashore	✓	✓
Mr. Joshua Zirbes	USCG, Sector Field Office Eastern Shore	✓	✓
Ms. Carrie Traver	EPA, Office of Environmental Programs	✓	✓
Ms. Barbara Rudnick	EPA, Office of Environmental Programs	✓	✓
Ms. Cindy Schulz	USFWS, Virginia Field Office	✓	✓
Ms. Emily Argo	USFWS, Virginia Field Office	✓	✓
Ms. Deborah Rocque	USFWS, Northeast Region	✓	✓
Mr. John Kasbohm	USFWS, Chincoteague and Wallops Island NWRs		✓
Mr. Bob Leffel	USFWS, Chincoteague and Wallops Island NWRs	✓	
Mr. Kevin Holcomb	USFWS, Chincoteague and Wallops Island NWRs	✓	✓
State Agencies			
Mr. Sean Mulligan	Mid-Atlantic Regional Spaceport	✓	✓
Mr. Timothy Roberts	Virginia Department of Historic Resources	✓	✓
Mr. Frank Piorko	Maryland Coastal Bays Program	✓	✓
Ms. René Hypes	Virginia Department of Conservation and Recreation	✓	✓
Ms. Anne Chazal	Virginia Department of Conservation and Recreation	✓	✓
Ms. Sheri Kattan	VDEQ, Office of Wetlands and Water Protection	✓	✓
Ms. Amy Ewing	VDGIF, Fish and Wildlife Information Service	✓	✓
Ms. Ruth Boettcher	VDGIF, Fish and Wildlife Information Service	✓	✓
Ms. Karen Duhring	Virginia Institute of Marine Science		✓
Ms. Emily Hein	Virginia Institute of Marine Science		✓
Ms. Allison Lay	VMRC, Habitat Management Division	✓	✓
Local Government			
Mr. Michael Mason	Accomack County Administration	✓	✓
Mr. Chris Guvernator	Accomack County Wetlands Board	✓	✓
Ms. Shannon Alexander	Accomack-Northampton Planning District	✓	✓
Mr. Rich Morrison	Accomack County Dept. of Building and Zoning	✓	✓
Mr. Michael Tolbert	Town of Chincoteague	✓	✓
Ms. Julie Wheatly	Wallops Research Park	✓	✓
Ms. C. Renata Major	Accomack County Board of Supervisors	✓	✓
Mr. Donald Hart Jr.	Accomack County Board of Supervisors	✓	✓
Ms. Vanessa Johnson	Accomack County Board of Supervisors	✓	✓
Mr. Howard "Jackie" Phillips	Accomack County Board of Supervisors	✓	✓
Mr. Harrison Phillips, III	Accomack County Board of Supervisors	✓	✓
Mr. Paul Muhly	Accomack County Board of Supervisors	✓	✓
Mr. Robert Crockett	Accomack County Board of Supervisors	✓	✓
Mr. Ronald Wolff	Accomack County Board of Supervisors	✓	✓

Table 6 1. List of Agencies and Persons Consulted for the EA

Name	Organization	Letter	Draft EA
Mr. William Tarr	Accomack County Board of Supervisors	✓	✓
Mr. Randy Laird	Somerset County Board of Commissioners	✓	✓
Mayor J. Arthur Leonard	Town of Chincoteague	✓	✓
Other Organizations and Individuals			
Mr. Alverne Chesterfield	Chincoteague Bay Field Station	✓	
Ms. Shayla Keller	Chincoteague Bay Field Station		✓
Bryan Watts	College of William and Mary, Center for Conservation Biology		✓
Debra Ryon	Navy Surface Combat Systems Center		✓
Mr. Scott Greene	Navy Surface Combat Systems Center	✓	✓
Mr. John Haag	Navy Surface Combat Systems Center	✓	✓
Mr. Peter Bale	Sentinel Robotic Solutions, LLC	✓	✓
Mr. Daryl Moore	VA Space / MARS	✓	✓
Mr. Gregg Frostrom	NOAA, Wallops Command and Data Acquisition Station	✓	✓
Mr. Ronald Simko	NASA; WFF Facilities Management Division	✓	✓
Tribes			
Ms. Caitlin Rogers	Catawba Indian Nation	✓	✓
Chief Mr. Stephen Adkins	Chickahominy Indian Tribe	✓	✓
Chief Mr. Lee Lockamy	Nansemond Indian Tribal Association	✓	
Chief Dr.Robert Gray	Pamunkey Indian Nation	✓	
Paramount Chief Mr. Norris Howard, Sr.	Pocomoke Indian Nation	✓	
Chief Ms. Anne Richardson	Rappahannock Tribe	✓	

7 List of Preparers

Table 7-1 summarizes the expertise and contributions made to the EA by the Project Team.

Table 7 1. List of Preparers

Name	Title, Education and Years of Experience	Area of Responsibility in EA
NASA		
Shari Miller	Environmental Engineer, BS Chemistry, BS Biology, 26 years	Center NEPA Manager, Document Development and Review
VCSFA		
Nate Overby	Civil Engineer, BS Civil Engineering, 10 years	VCSFA Project Manager, Document Review
GBA		
Bill Murchison	Civil Engineer, BS Civil Engineering, 33 Years	Port Design, Construction and Planning, Dredging & Dredged Material Placement
Ben Cushing	Civil Engineer, BS Civil Engineering, 6 years	Dredging, Dredged Material Placement
AECOM (Contractor to NASA)		
Bobbie Hurley	Project Manager, MA, Chemistry; BS, Chemistry; BS, Biology; 30+ years	DOPAA and Draft EA technical review
Erika Grace	Project Coordinator; MS Environmental Toxicology, BS Biological Sciences; 13 years	DOPAA Author, Final EA technical reviewer
Mike Deacon	Scoping/EA Technical Lead; B.S. Environmental Studies, B.S. Environmental Health, 29 years	DOPAA Author; Land Resources; Water Resources; and Cumulative Impacts
Steve Dillard	Biological Resources Lead; MS, Environmental Systems Engineering, BS, Zoology; 30+ years	Vegetation, Wildlife, EFH, Special Status Species; ESA Consultation letters preparer
Anneliesa Barta	EA Author; MBA Finance; 10 years	Noise, Land Use, Transportation
Carol Freeman	Archaeological Resources Lead; MS Geological Sciences; MS Space Studies; BS Geology; 23 years	Archaeological Resources/Section 106 consultation reviewer
Katherine Winterstein	EA Author; BS Anthropology; 1 year	Archaeological Resources
Catherine Lavagnino	EA Reviewer; Environmental Science; BS Environmental Science; 10+ years	Biological Resources
Alex Novotny	EA Author; Master of Natural Resource Management, BS Geology; 2 years	Vegetation and Wildlife
Matthew Batdorf	EA Author; BS Environmental Science, 5+ years	EFH and Special Status Species
Laura Owens	EA Author; BS Physics; BS Geology; 20+ years	MEC, Health and Safety, Infrastructure and Utilities
Kristen Beckhorn	EA Author; PhD Environmental Toxicology, MS Environmental Toxicology, BS Environmental Science; 9 years	Permits, Mitigation and Monitoring, and Cumulative Impacts
Amy Vargas	Technical Reviewer; MS Biology, BS Botany; 14 years	Noise, MEC, Health and Safety, Transportation, Infrastructure and Utilities

Table 7 1. List of Preparers		
Name	**Title, Education and Years of Experience**	**Area of Responsibility in EA**
Russell Kiesling	Technical Reviewer; MA Public Administration and Management, MS Zoology, BS Biology; 33 years	DOPAA

The following MARAD and USACE staff reviewed the EA as a Cooperating Agency:

- Alan Finio, MARAD
- Brian Denson, USACE

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