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.

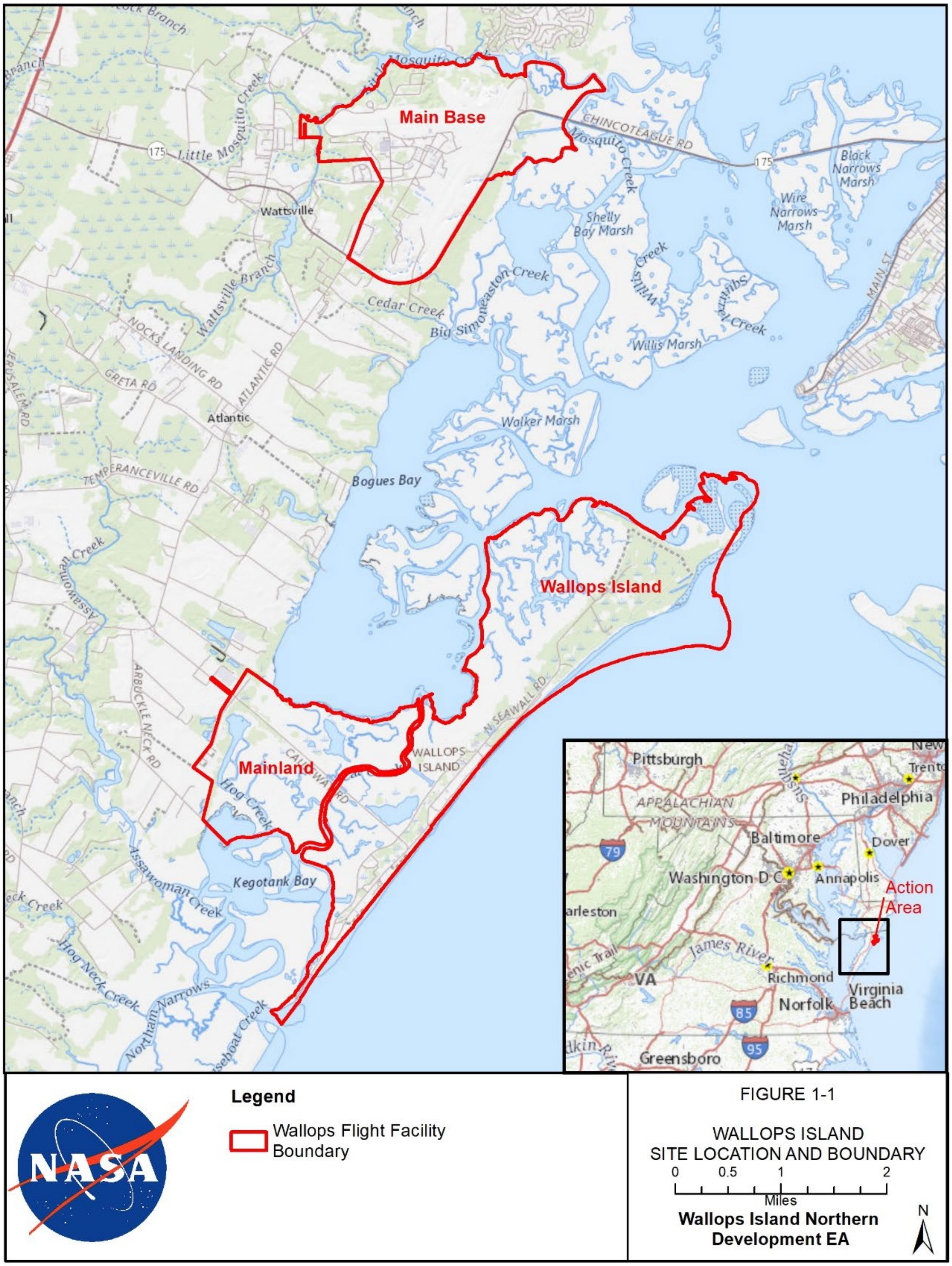

Figure 1-1. Wallops Island Site Location and Boundary

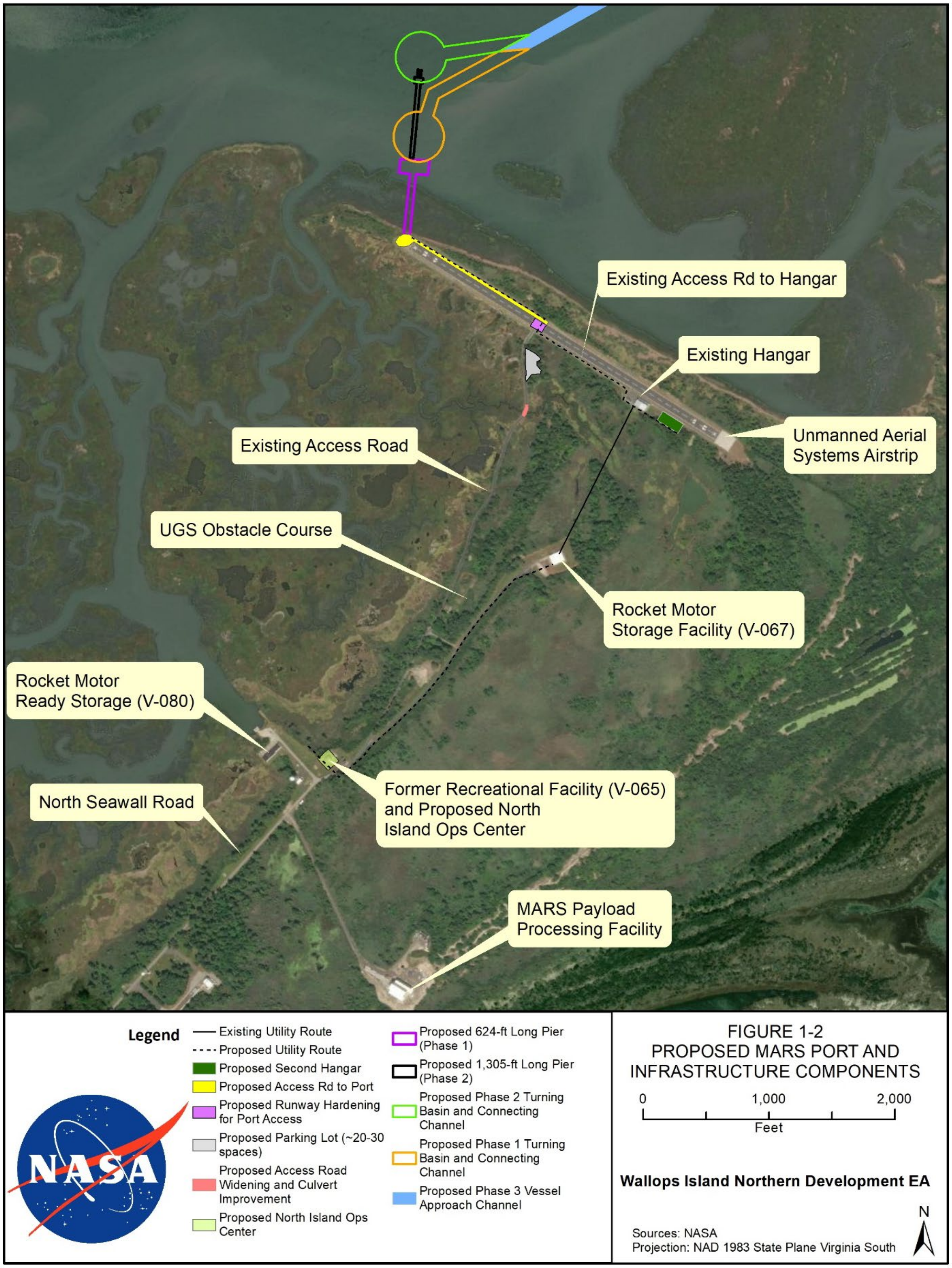

Figure 1-2. Proposed MARS Port and Infrastructure Components

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.

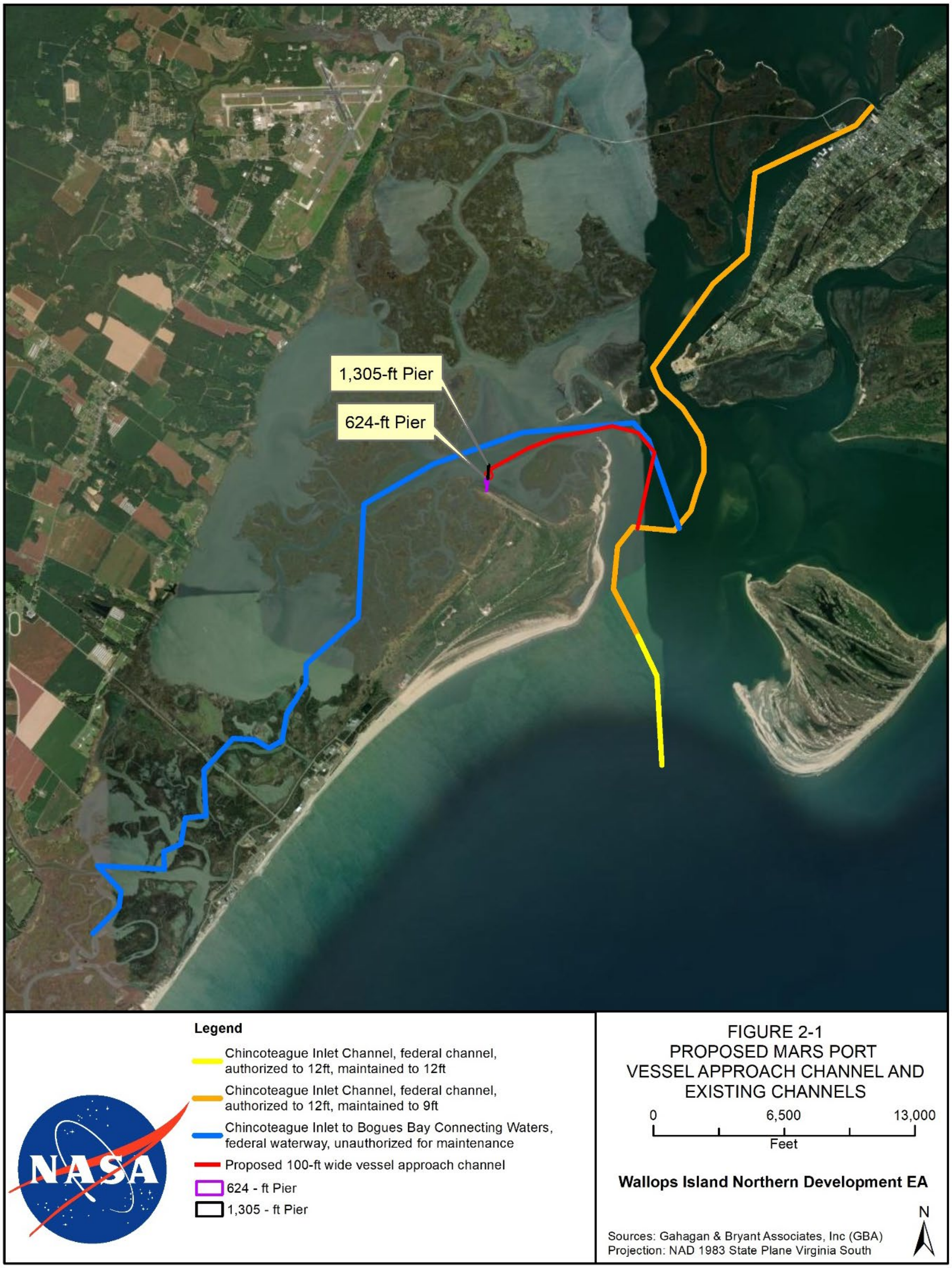

Figure 2-1. Proposed MARS Port Vessel Approach Channel and Existing Channels

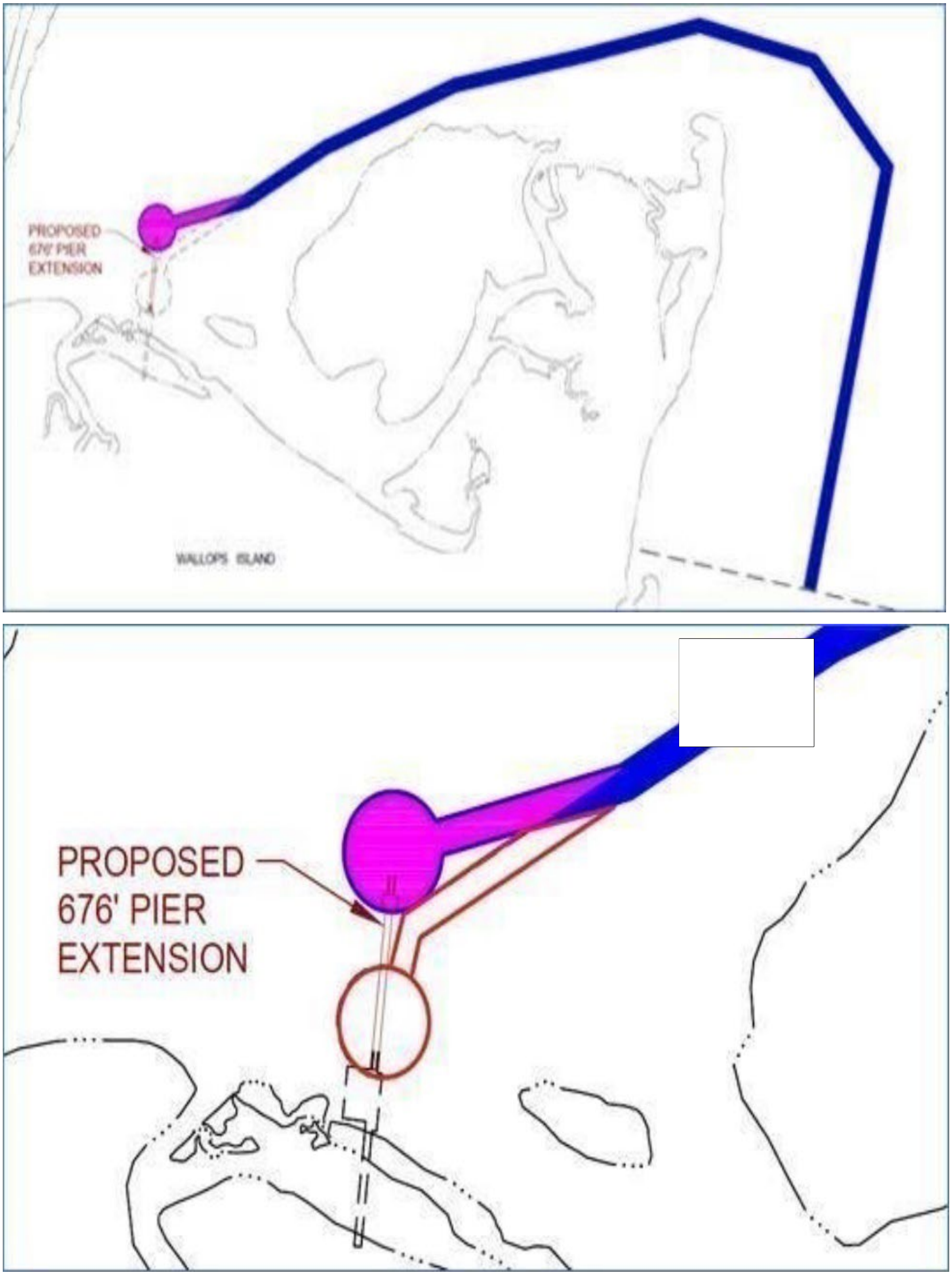

Figure 2-2. Diagram of Proposed Phased Construction

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.

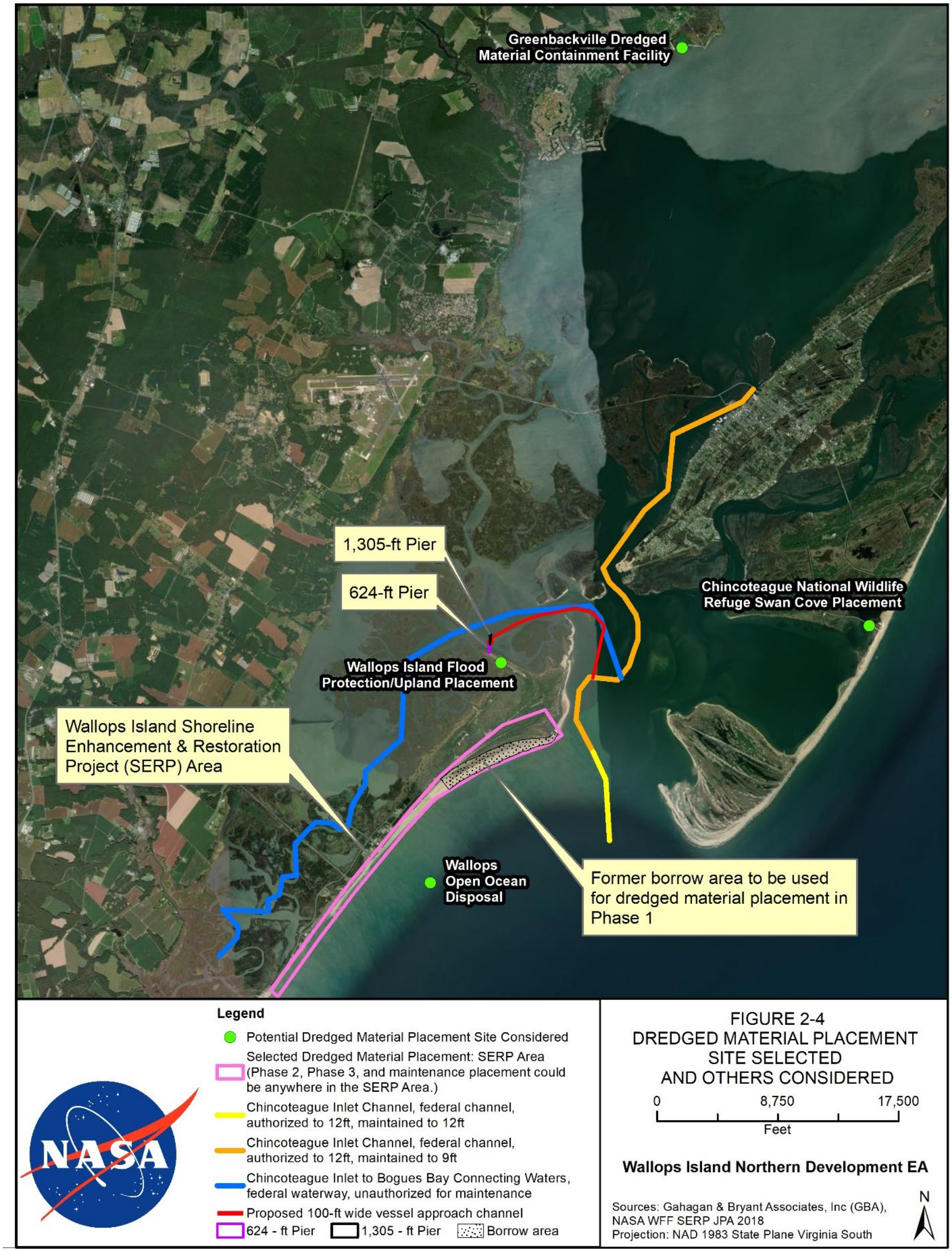

Figure 2-4. Dredged Material Placement Site Selected and Others Considered

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.

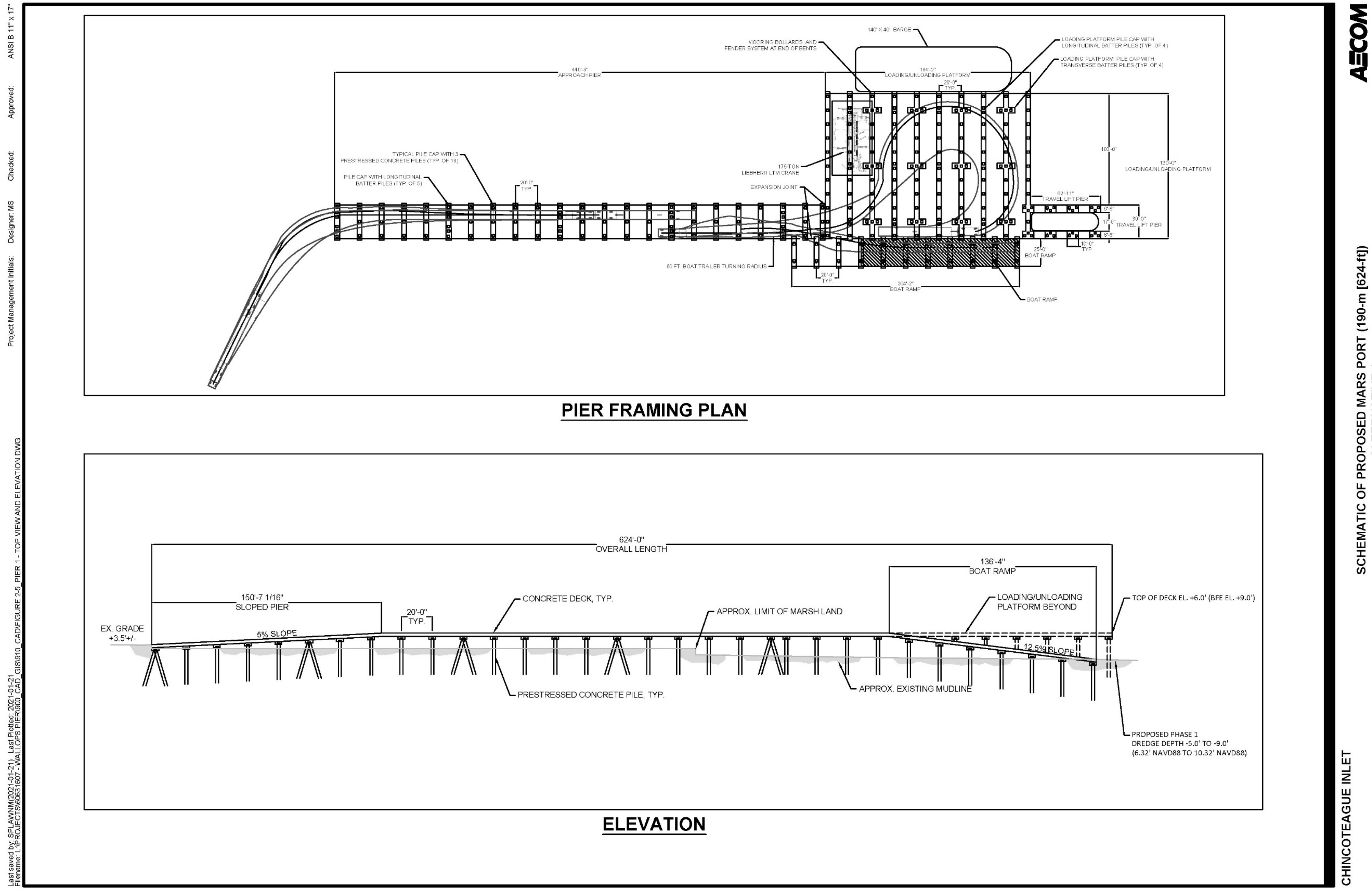

Figure 2-5. Preliminary Schematic of Proposed MARS Port – Phase 1

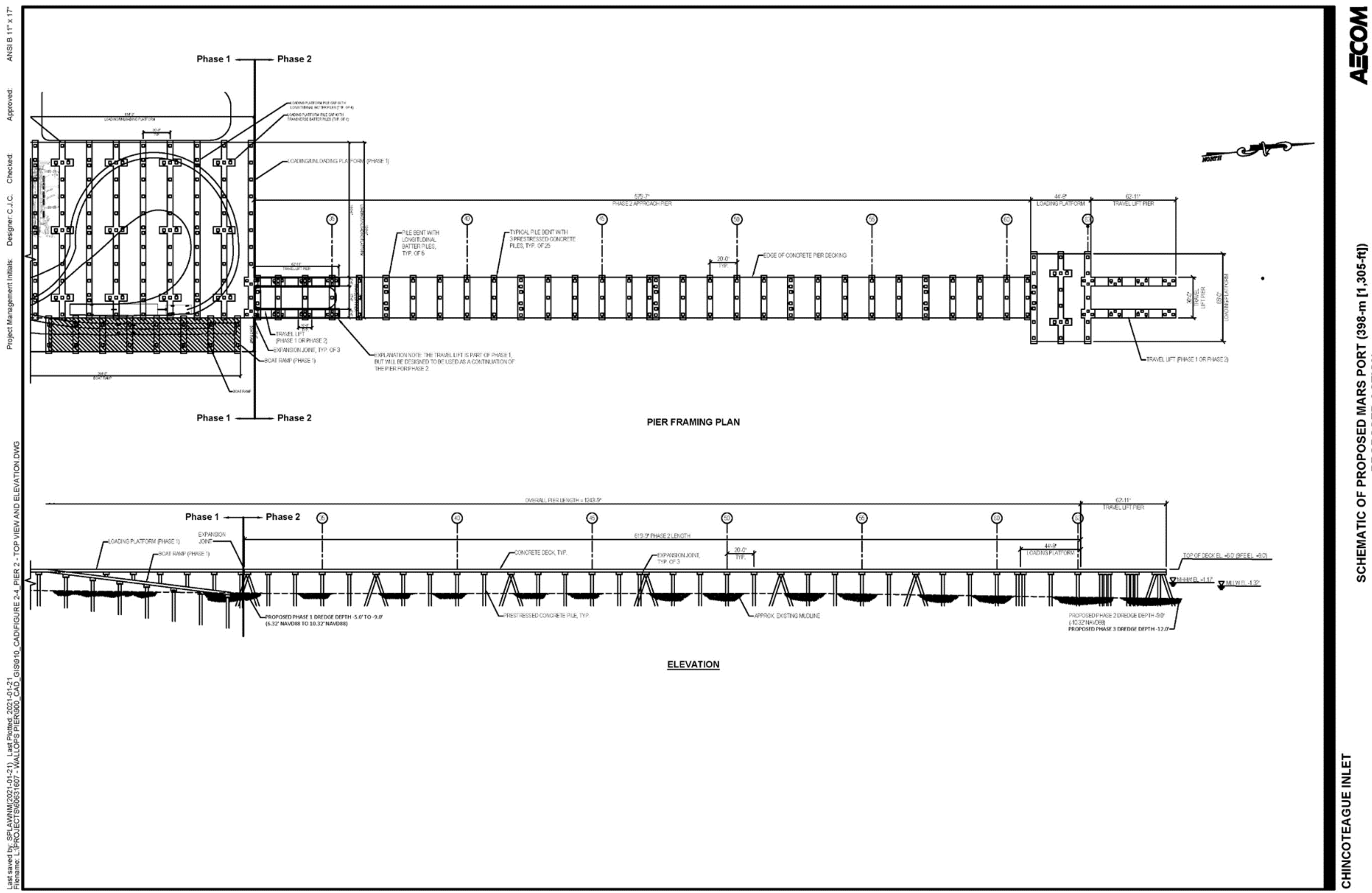

Figure 2-6. Preliminary Schematic of Proposed MARS Port – Phase 2

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.

Endangered Species Act (ESA) (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).

Virginia ESA (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.

Bald and Golden Eagle Protection Act (BGEPA) (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.

Migratory Bird Treaty Act (MBTA): 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.

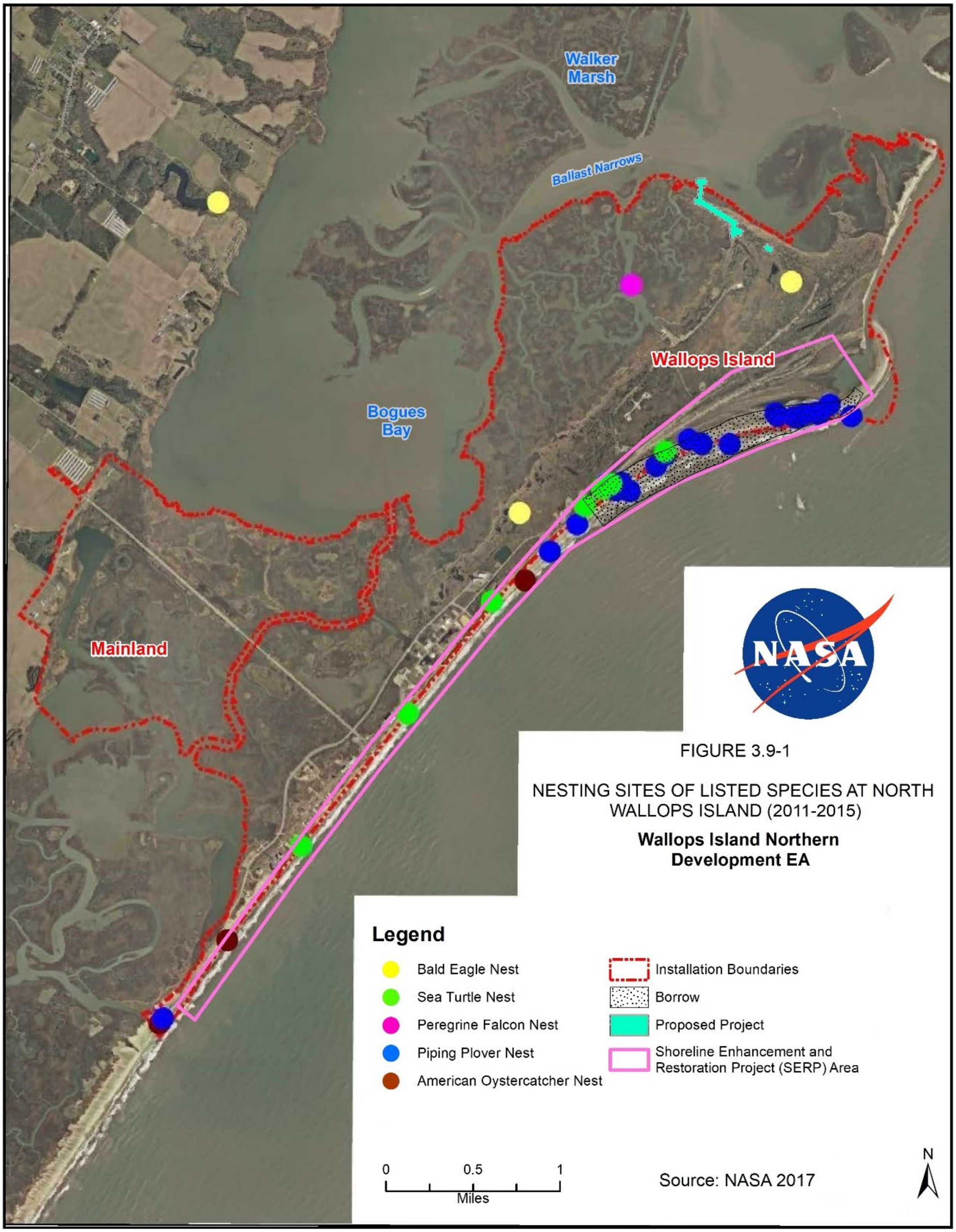

Figure 3.9-1. Special-Status Species at WFF Wallops Island and Mainland (2011-2015)

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).

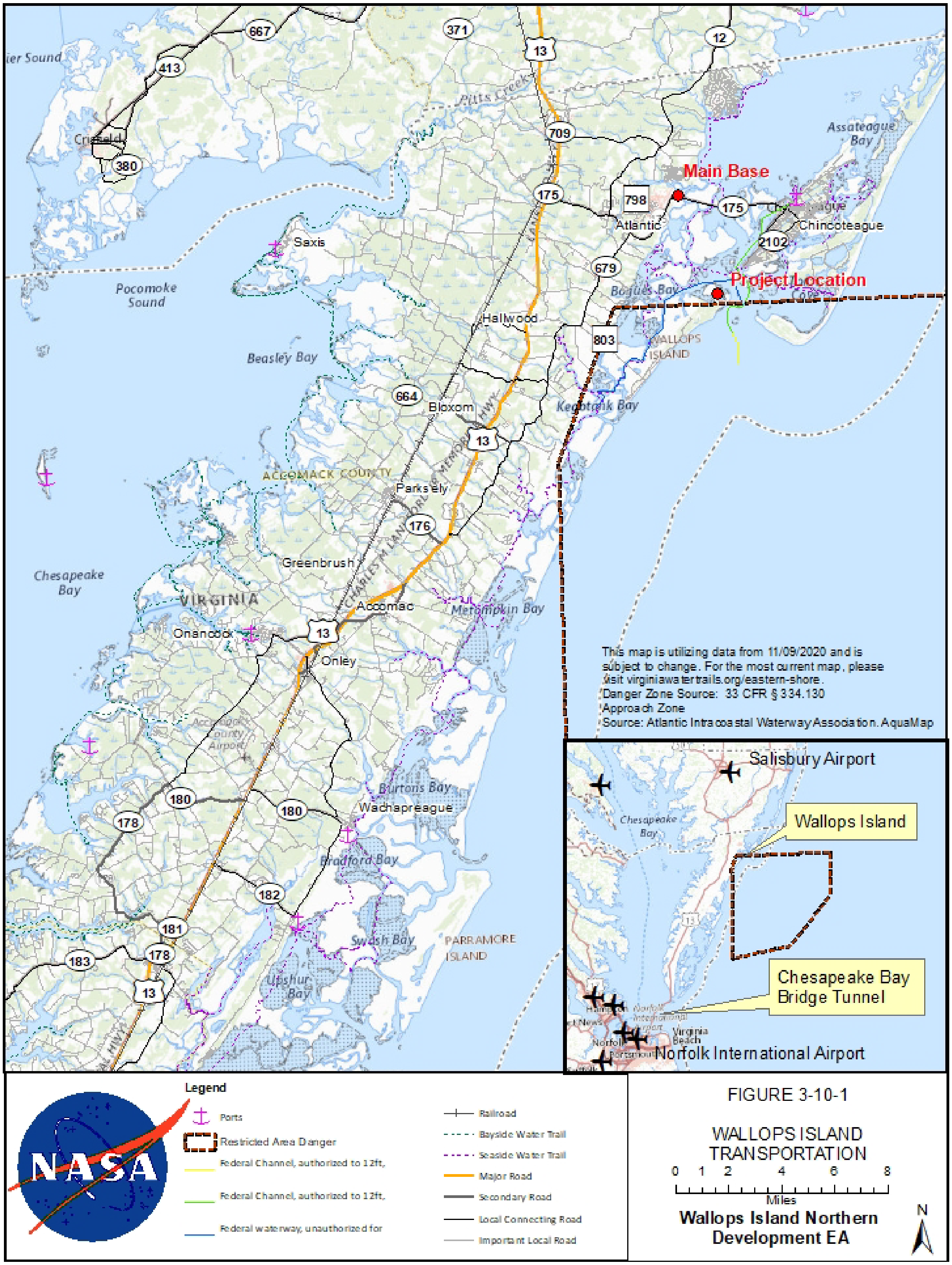

Figure 3.10-1. Transportation Network near Wallops Island

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

Resource	EA Section	Type of Impact from the Proposed Action	Analyzed in CEA?
Table 5 1. Summary of Potential Environmental Impacts			
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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APPENDIX A –

COOPERATING AGENCY COORDINATION

National Aeronautics and Space Administration

Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337

August 18, 2020

Reply to Attn of: 250.W

Ms. Kristine Gilson
Office of Environment
Department of Transportation, Maritime Administration
1200 New Jersey Avenue SE
Washington, DC 20590

Subject: Cooperating Agency Request for NASA Wallops Island Northern Development Environmental Assessment

Dear Ms. Gilson:

In accordance with the National Environmental Policy Act (NEPA), the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center's Wallops Flight Facility (WFF), in conjunction with the Virginia Commercial Space Flight Authority (Virginia Space), are preparing an Environmental Assessment (EA) to evaluate the potential environmental effects associated with future development of northern Wallops Island, including a port facility. For the port facility, Virginia Space has indicated a desire to apply for construction grants administered and awarded by the Department of Transportation's Maritime Administration (MARAD). Therefore, in accordance with the Council on Environmental Quality's (CEQ) NEPA guidelines (specifically 40 CFR Part 1501.6) and CEQ's 2003 guidance on cooperating agencies, NASA requests MARAD's participation as a cooperating agency for the development of the EA.

As the lead agency, NASA will be responsible for:

1. Determining the scope of the EA, including the alternatives evaluated.
2. Gathering all necessary background and technical information to support the preparation of the EA.
3. Preparing all necessary permit applications associated with the proposed action.
4. Consulting with other federal agencies, such as the National Marine Fisheries Service (NMFS) and U.S Fish and Wildlife Service (USFWS) to determine compliance with the Marine Mammal Protection Act (MMPA), Endangered Species Act (ESA), and other natural resources related laws.

5. Consulting with state and local officials to determine compliance with the Coastal Zone Management Act (CZMA) and other relevant environmental laws.
6. Circulating the appropriate NEPA documentation to the general public and any other interested parties.
7. Scheduling and supervising meetings held in support of the NEPA process and compiling any comments received.
8. Maintaining an administrative record and responding to any Freedom of Information Act requests relating to the EA.

NASA respectfully requests that MARAD, in its role as a cooperating agency, provide support as follows:

1. Participate in various portions of the EA development for issues your agency has special expertise; and

2. Make staff available for interdisciplinary project review of the EA.

As the point of contact for this action, I can be reached at 757-824-2327 or Shari.A.Miller@nasa.gov.

Sincerely,

Digitally signed by SHARI MILLER
Date: 2020.08.18 09:29:01 -04'00'

Center NEPA Manager

Enclosures:

cc:
250/Ms. K. Finch
250/Mr. T. Meyer
VCSFA/Mr. S. Mulligan
VCSFA/Mr. N. Overby

DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS
NORFOLK DISTRICT
FORT NORFOLK
803 FRONT STREET
NORFOLK VA 23510-1011

Reply to
Attention of

September 23, 2020

CENAO-WR-E
Eastern Projects Section
NAO-2020-1758

Shari Miller
Center NEPA Manager &
Environmental Planning Lead
NASA GSFC Wallops Flight Facility
Wallops Island, VA 23337

Dear Ms. Miller:

This is in response to your letter dated August 18, 2020 requesting USACE's participation as a cooperating agency for the development of an Environmental Assessment (EA) to evaluate the potential environmental effects associated with future development of northern Wallops Island, including a port facility. USACE will participate as a cooperating agency in the preparation of the EA. We recommend the use of a collaborative process for the study of this project, documenting concurrence of the pertinent Federal agencies at important steps, to provide the local governments and the public with a more dependable framework for planning decisions.

Depending on the construction method as well as the LEDPA, it is likely the project will impact waters and/or wetlands regulated by the Norfolk District Army Corps of Engineers (USACE) under Section 10 of the Rivers and Harbors Act (33 U.S.C. § 403) and Section 404 of the Clean Water Act (33 U.S.C. §1344). A permit will be required for impacts to these waters.

To determine the limits of our jurisdiction, our office will require a wetland delineation be performed for all areas of disturbance including laydown areas.

This project will also require a Section 408 review by our Operations Branch. This process has to be completed before a Department of the Army permit can be issued. To initiate this process, please send any drawings you may currently have showing the location and possible footprints of the port facility.

<u>Historic Resources</u>. The project may affect historic and cultural resources. As per 36 CFR 800.2(a)(2), the NASA is hereby designated as the lead Federal agency to fulfill the collective federal responsibilities under Section 106 of the National Historic Preservation Act for the undertaking. We authorize your agency to conduct Section 106 coordination on our behalf. Any Memorandum of Agreement prepared by your agency under 36 CFR 800.6 should include the following clause in the introductory text:

"*Whereas, pursuant to Section 10 and/or Section 404 of the Clean Water Act, a Department of the Army permit will likely be required from the Corps of Engineers for this project, and the Corps has designated NASA as the lead federal agency to fulfill federal responsibilities under Section 106*;"

Threatened and Endangered Species: Pursuant to 50 CFR 402.07, the Corps authorizes your agency to conduct Section 7 coordination with the U.S. Fish and Wildlife Service (USFWS) as well as the National Marine Fisheries Service (NMFS) on our behalf as well, concerning potential effects to Federally-listed threatened and endangered species. NASA will be responsible for completing all coordination pursuant to ESA, regardless of whether it occurs during the NEPA process or during the permitting process. In addition, we recommend that all documentation and coordination, including the IPAC determination, be included in the NEPA document.

Essential Fish Habitat. Pursuant to 50 CFR 600.920(b), the Corps authorizes your agency to conduct MSA consultation with the National Oceanic and Atmospheric Administration (NOAA) Fisheries on our behalf as well, concerning potential effects to Essential Fish Habitat. NASA is responsible for completing all coordination pursuant to MSA, regardless of whether it occurs during the NEPA process or during the permit process. In addition, we recommend that all documentation and coordination be included in the NEPA document.

Thank you for the opportunity to comment on the preparation of the EA. To the extent that workload and scheduling allow, we will participate in stakeholder meetings. However, we request that NASA will consider separate meetings with the Cooperating Agencies as needed to resolve issues.

You may contact at brian.c.denson@usace.army.mil or 757-201-7792 if you have any questions.

Sincerely,

Brian Denson
Environmental Scientist
Eastern Virginia Regulatory Section

From: Gilson, Kristine (MARAD)
To: Miller, Shari A. (WFF-2500); Kendle, Erin (MARAD)
Cc: Nate Overby; Sean Mulligan (sean.mulligan@vaspace.org); Meyer, T J (WFF-2500); Finch, Kimberly (GSFC-2500)
Subject: [EXTERNAL] RE: NASA Wallops Island Northern Development EA
Date: Tuesday, August 25, 2020 11:58:36 AM

Hi,

Do you just need an email response that MARAD agrees to be a cooperating agency? If so, then this email serves as notification that MARAD agrees to be a cooperating agency on the EA. Thanks.

Kris Gilson, REM, CHMM
Office of Environment
MAR-410, Mail Drop #1
Maritime Administration
US Department of Transportation
Southeast Federal Center, West Bldg
1200 New Jersey Ave SE
Washington, DC 20590
Phone 202-366-1939
Cell 202-603-2402
kristine.gilson@dot.gov

From: Miller, Shari A. (WFF-2500) <shari.a.miller@nasa.gov>
Sent: Tuesday, August 18, 2020 9:40 AM
To: Gilson, Kristine (MARAD) <kristine.gilson@dot.gov>; Kendle, Erin (MARAD) <erin.kendle@dot.gov>
Cc: Nate Overby <nathan.overby@vaspace.org>; Sean Mulligan (sean.mulligan@vaspace.org) <sean.mulligan@vaspace.org>; Meyer, T J (WFF-2500) <theodore.j.meyer@nasa.gov>; Finch, Kimberly (GSFC-2500) <kimberly.s.finch@nasa.gov>
Subject: NASA Wallops Island Northern Development EA

Good morning, Kris,

Please find attached, NASA Wallops Flight Facility's request for MARAD's participation as a cooperating agency for the development of the Wallops Island Northern Development Environmental Assessment. Please let me know if your agency accepts this request or has any questions or concerns.

Thank you.

Shari A. Miller
Center NEPA Manager &
Environmental Planning Lead

NASA GSFC Wallops Flight Facility
Wallops Island, VA 23337
(757) 824-2327
Shari.A.Miller@nasa.gov
https://code200-external.gsfc.nasa.gov/250-wff/

"Be kind whenever possible. It is always possible." - Dalai Lama

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APPENDIX B –

WETLANDS AND WATERS DELINEATION

REPORTS

Wetlands and Waters Delineation Report

Prepared for the

NASA WFF Wallops Pier

Wallops Island, Virginia

Prepared for

National Aeronautics and Space Administration
Wallops Flight Facility
32400 Fulton St.
Wallops Island, VA 23337

Prepared by

4840 Cox Road
Glen Allen, VA 23060

October 29, 2020

Table of Contents

APPENDICES

1.0 SITE DESCRIPTION

1.1 Introduction

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) has proposed infrastructure developments on the north end of Wallops Island (Study Area). These developments constitute a new Intermodal Facility at Wallops Island and could include: construction and operation of a Wallops Island Pier Area in proximity to the Mid-Atlantic Regional Spaceport (MARS) Unmanned Aerial Systems (UAS) airstrip; construction of a second hangar at the UAS airstrip; addition of potable and waste water lines to the hangars; addition of airstrip lighting; improvements to the airstrip access road including doubling of the existing culvert and construction of a 20-30 vehicle parking lot; and construction of a project support building at the entrance of the access road to the airstrip. According to the United States Maritime Administration (MARAD), this project has the potential to grow existing site capabilities at Wallops Island; enhance science, technology, engineering, and mathematics (STEM) research opportunities; and spur high-tech/high-paying jobs in a predominately rural area.

The Study Area is located on Wallops Island in Accomack County, Virginia, east of Atlantic Road (route 679), north of Causeway Road (route 803), and south of Chincoteague Island, and can be accessed from North Seawall Road. The approximate 14-acre Study Area location is depicted in **Appendix A, Figures 1 and 2**.

1.2 Topography and Geology

The United States (US) Geological Survey (USGS) Quadrangle map for Chincoteague West, VA (2019) depicts the Study Area with a mix of generally flat non-vegetated areas and vegetated submerged swamps. Upland elevations range from 5 feet above mean sea level (amsl) to 0 feet amsl (**Figure 1**). Aerial imagery (**Figure 2**) depicts similar environments as the USGS Quadrangle map, but also shows paved roads, maintained shoulders, and a runway.

The Study Area occurs in the Atlantic and Gulf Coastal Plain (USACE, 2010); more specifically, the United States Department of Agriculture (USDA) National Resources Conservation Services (NRCS) Major Land Resource Area (MLRA) Northern Tidewater Area (153D) subregion of Land Resource Region (LRR) T. The topography of the Atlantic and Gulf Coastal Plain region ranges from level to hilly terrain and is composed mainly of sedimentary rocks and alluvial sediments (USACE, 2010).

1.3 Soils

USDA NRCS Web Soil Survey (WSS) indicates the Study Area is predominately underlain by hydric soils. The following hydric soils can be found within the Study Area: Camocca fine sand along the runway, Chincoteague silt loam south and north of the runway, and Fisherman-Camocca complex by the hangar (USDA NRCS, 2020). The USDA NRCS WSS indicates that Fisherman-Assateague complex, a non-hydric soil, occurs north of the Study Area (USDA NRCS, 2020). Hydric soil percentages are shown in **Figure 3** and summarized in **Table 1**.

Table 1: USDA NRCS Web Soil Survey Map Units

CaA	Camocca fine sand, 0 to 2 percent slopes, frequently flooded	97	53.4
ChA	Chincoteague silt loan, 0 to 1 percent slopes, very frequently flooded	100	14.0
FmD	Fisherman-Assateague complex, 0 to 35 percent slopes, rarely flooded	5	16.9
FrB	Fisherman-Camocca complex, 0 to 6 percent slopes, frequently flooded	42	4.2
W	Water	0	11.5

* The hydric rating indicates the percentage of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Each map unit is rated based on its respective components and the percentage of each component within the map unit.

1.4 NWI Wetlands

The United States Fish and Wildlife Service (USFWS) is the principal U.S. Federal agency tasked with providing information to the public on the status and trends of our Nation's wetlands. The National Wetland Inventory (NWI) is a publicly available resource that provides detailed information on the abundance, characteristics, and distribution of U.S. wetlands. The USFWS-NWI mapper was used to assess the possibility of wetlands occurring within the Study Area (USFWS, 2020). NWI mapping identified one estuarine intertidal emergent persistent regularly flooded wetland (E2EM1N) and one palustrine emergent persistent semi permanently flooded wetland (PEM1F) within the Study Area (**Figure 3**).

2.0 FIELD INVESTIGATION – METHODOLOGY

2.1 Wetlands Investigation and Delineation

On July 28 and August 31, 2020, a wetland and waters field investigation was conducted by AECOM Technical Services, Inc. (AECOM). The waters of the U.S. (WOUS) investigation was performed in accordance with the 1987 United States Army Corps of Engineers (USACE) Wetlands Delineation Manual (USACE, 1987), and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0, USACE, 2010). Any WOUS that were identified were flagged in the field with consecutively numbered Wetland Delineation flags and were located using a hand-held Global Positioning System (GPS) with sub-meter accuracy. The collected data is depicted in **Figure 4**. USACE Wetland Determination Data Forms are provided in **Appendix B**.

2.2 Surface Water Feature Investigation

Potentially regulated surface water features within the Study Area were delineated in accordance with the USACE Jurisdictional Determination Instructional Guidebook (USACE and EPA, 2007), and the guidelines in the USACE Regulatory Guidance Letter No. 05-05, Ordinary High Water Mark Identification Regulatory Guidance Letter (USACE, 2005).

3.0 FIELD INVESTIGATION – RESULTS

3.1 General Site Conditions

The Study Area consists of predominantly developed areas including roads, a runway, and structures associated with the runway. Site conditions were consistent with aerial imagery (**Figure 2**). Wetland delineation boundaries were generally consistent remnant flagging found east of the access road. It is presumed that the flagging remains are from the 2009 report by Timmons entitled *Wetland Delineation Package Uninhabited aerial Systems Airfield at Wallops Flight Facility (161.1 acres)* NAO-2011-0424, Timmons Group "UAS Airfield at WFF" April 3, 2009.

3.2 Wetland Investigation and Delineation Results

AECOM environmental scientists identified two potentially regulated wetlands within the Study Area (wetland WA and WB) through field investigation. Wetland WA is an estuarine emergent wetland (EEM) located southeast of the intersection of North Seawall Road and the runway within the Study Area. Wetland WA comprises approximately 66,618 square feet (1.53 acres) within the Study Area but extends outside of the Study Area to the southeast. Wetland WB is located west of the intersection of North Seawall Road and the runway as well as north of the runway. Wetland WB is an EEM wetland that comprises approximately 155,119 square feet (3.56 acres) within the Study Area but extends outside of the Study Area to the south, west, and north. Both wetlands were vegetated. Wetlands located within the Study Area are described in **Table 2**.

Wetland locations are shown in **Figure 4**. Associated photos are included in **Appendix C**.

Table 2: Summary of Wetland Features in the Study Area

WA	Tidal	EEM	66,618	1.53
WB	Tidal	EEM	155,119	3.56
	Total		**221,737**	**5.09**

* Cowardin classification based on information from USFWS-NWI mapper and AECOM's July and August 2020 wetland delineation

3.2.1 Wetland and Upland Vegetation

EEM wetlands within the Study Area were typified by species frequently found in tidal marshes such as common reed (*Phragmites australis*), Jesuit's-bark (*Iva frutescens*), salt-meadow cord grass (*Spartina patens*), and southern bayberry (*Morella cerifera*). Forested uplands within the Study Area were typified by eastern redcedar (*Juniperus virginiana*), black cherry (*Prunus serotina*), loblolly pine (*Pinus taeda*), slender goldentop (*Euthamia caroliniana*), and horsebrier (*Smilax rotundifolia*).

3.3 Surface Water Feature Investigation Results

During AECOM's field investigation no surface water features were field located within 50 feet of the runway within the Study Area. One surface water feature was aerially interpreted in the northwest corner of the Study Area due to not being accessible by foot because of tidal water levels (**Figure 4)**.

4.0 REFERENCES

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Appendix A: Project Figures

AECOM

National Aeronautic Space Administration Wallops Island Flight Facility 2020

Wallops Pier
Accomack County, VA

Last Date Edited: 9/10/2020
Project Number: 60632314

0 1,500 3,000
Feet

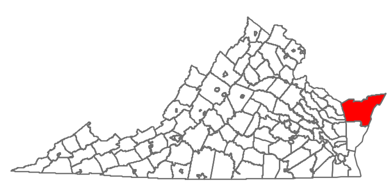
Legend

Study Area

N
W E
S

Note: This map is for reference only
NAD83 State Plane Virginia North;
Topographic Map Source: ESRI, 2019

Figure 1
Project Vicinity



Accomack County

AECOM

National Aeronautics and Space Administration Wallops Flight Facility 2020

Wallops Pier
Accomack County, VA

Last Date Edited: 9/10/2020
Project Number: 60632314

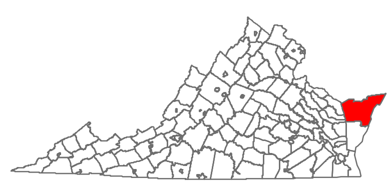
0 500 1,000 Feet

Legend

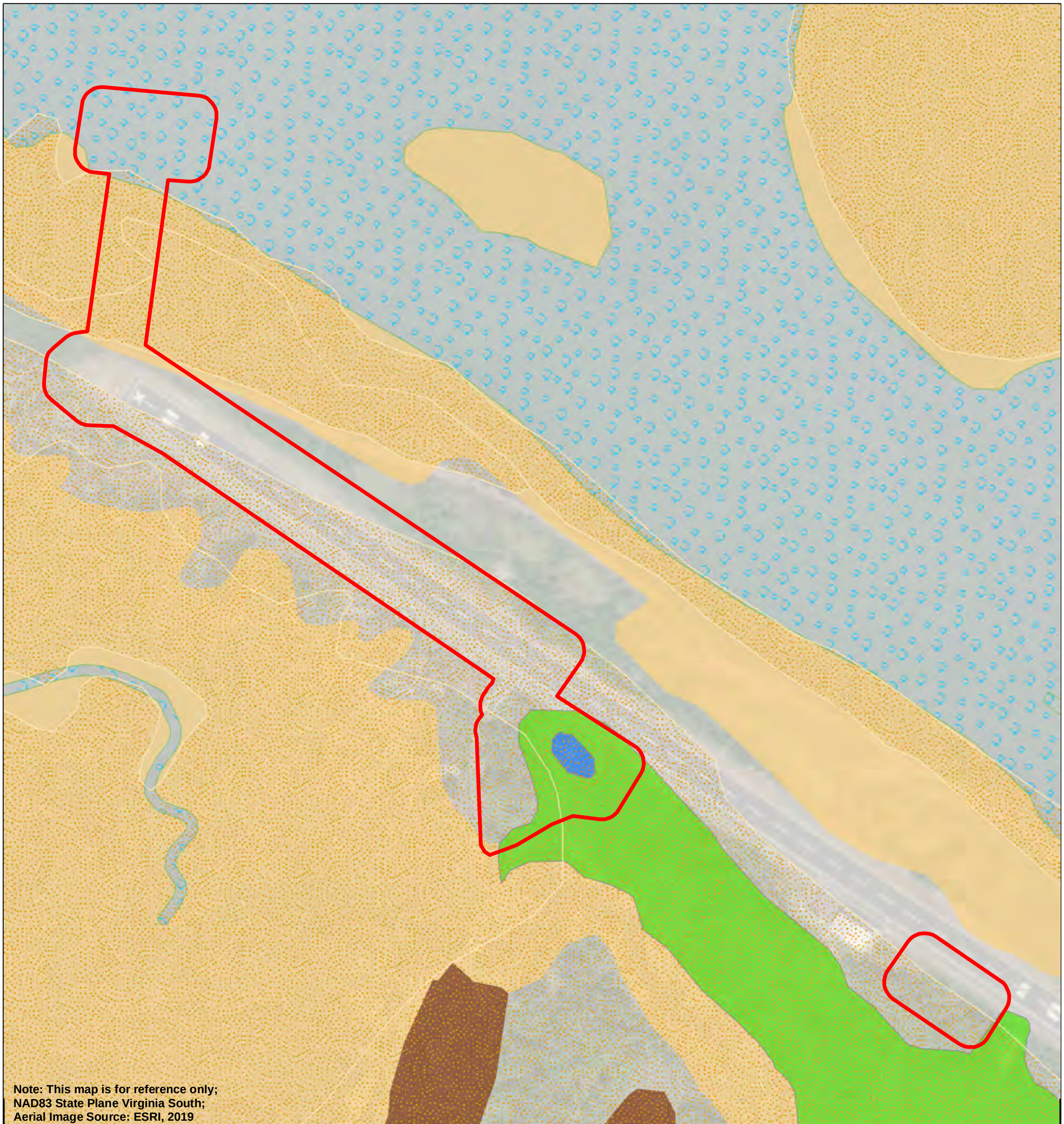
Study Area

Notes: This map is for reference only.
NAD83 State Plane Virginia North; Aerial Image Source: ESRI, 2019

Figure 2
Project Location



Accomack County



AECOM

National Aeronautics and Space Administration Wallops Flight Facility 2020

Wallops Pier
Accomack County, VA

Last Date Edited: 9/10/2020
Project Number: 60617789

Legend

Study Area

0 250 500 Feet

Hydric Soil Rating (NRCS, 2020)

Hydric (66 to 100%)

Waters of the US (NWI, 2020)

Estuarine and Marine Deepwater

Estuarine and Marine Wetland

Freshwater Emergent Wetland

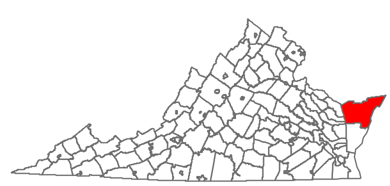
Freshwater Forested/Shrub Wetland

Freshwater Pond

N W E S

Figure 3

Background Resources Map



Accomack County

AECOM

National Aeronautics and Space Agency
Wallops Flight Facility
2020

Wallops Pier
Accomack County, VA

Last Date Edited: 9/10/2020
Project Number: 60631607

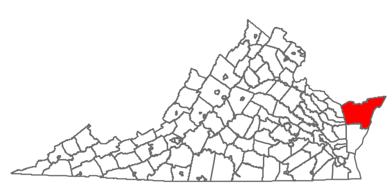
0 300 600 Feet

Legend

- Study Area
- Wetlands
- Surface Water
- Determination Points

N
W E
S

Figure 3
Wetland Delineation Map



Accomack County

Appendix B: USACE Wetland Determination Data Forms

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Wallops Pier City/County: Accomack Sampling Date: 7/28/2020

Applicant/Owner: NASA State: VA Sampling Point: UPL Hangar

Investigator(s): M. Batdorf and C. Lavagnino Section, Township, Range: ______

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Convex Slope (%): 1

Subregion (LRR or MLRA): MLRA 153D of LRR T Lat: 37.883684 Long: -75.434666 Datum: WGS84

Soil Map Unit Name: CaA - Camocca fine sand, 0 to 2 percent slopes, frequently flooded NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes x No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes x No ______	Is the Sampled Area within a Wetland?	Yes ______ No x
Hydric Soil Present?	Yes ______ No x		
Wetland Hydrology Present?	Yes ______ No x		

Remarks:

Data point taken within upland southeast of the hangar and south of the runway. Hydrophytic vegetation passes dominance and prevalence tests due to facultative species.

Observed Classifications:

Cowardin: N/A

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present? Yes ______ No x Depth (inches): ______

Water Table Present? Yes ______ No x Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ______ No x Depth (inches): ______

Wetland Hydrology Present? Yes ______ No x

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No hydrology indicators present

AECOM has prepared this form using "data-entered" copies of the wetland determination data form in Appendix C in the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region, Version 2.0, November 2010. The resulting data sheet uses the 2016 National Wetland Plant List (v3.3) Regional List and the 2019 Web Soil Survey.

VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: UPL Hangar

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Prunus serotina, Black Cherry	5	Yes	FACU
2.			
3.			
4.			
5.			
6.			
	5 = Total Cover		
50% of total cover: 2.5	20% of total cover: 1		

Sapling Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Prunus serotina, Black Cherry	5	Yes	FACU
2. Pinus taeda, Loblolly Pine	5	Yes	FAC
3.			
4.			
5.			
6.			
	10 = Total Cover		
50% of total cover: 5	20% of total cover: 2		

Shrub Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Pinus taeda, Loblolly Pine	20	Yes	FAC
2. Juniperus virginiana, Eastern Red-Cedar	10	Yes	FACU
3. Morella cerifera, Southern Bayberry	5	No	FAC
4. Rhus copallinum, Winged Sumac	2	No	UPL
5.			
6.			
	37 = Total Cover		
50% of total cover: 18.5	20% of total cover: 7.4		

Herb Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Chasmanthium laxum, Slender Wood-Oats	25	Yes	FACW
2. Euthamia caroliniana, Slender Goldentop	15	Yes	FAC
3. Toxicodendron radicans, Eastern Poison Ivy	10	No	FAC
4. Rubus argutus, Saw-Tooth Blackberry	10	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	60 = Total Cover		
50% of total cover: 30	20% of total cover: 12		

Woody Vine Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Smilax rotundifolia, Horsebrier	60	Yes	FAC
2.			
3.			
4.			
5.			
	60 = Total Cover		
50% of total cover: 30	20% of total cover: 12		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 62.5% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	25	x 2 = 50
FAC species	125	x 3 = 375
FACU species	20	x 4 = 80
UPL species	2	x 5 = 10
Column Totals:	172 (A)	515 (B)

Prevalence Index = B/A = 2.99

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

x 2 - Dominance Test is >50%

x 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes x No ___

Remarks: (If observed, list morphological adaptations below).

Data point passes dominance and prevalence tests due to high number of facultative species.

SOIL

Sampling Point: UPL Hangar

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-1	10YR 3/1	100%					Sandy loam	
1-8	7.5YR 4/2	100%					Loamy sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Organic Bodies (A6) **(LRR P, T, U)**
___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
___ Muck Presence (A8) **(LRR U)**
___ 1 cm Muck (A9) **(LRR P, T)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Coast Prairie Redox (A16) **(MLRA 150A)**
___ Sandy Mucky Mineral (S1) **(LRR O, S)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7) **(LRR P, S, T, U)**
___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
___ Thin Dark Surface (S9) **(LRR S, T, U)**
___ Loamy Mucky Mineral (F1) **(LRR O)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Marl (F10) **(LRR U)**
___ Depleted Ochric (F11) **(MLRA 151)**
___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
___ Umbric Surface (F13) **(LRR P, T, U)**
___ Delta Ochric (F17) **(MLRA 151)**
___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) **(LRR O)**
___ 2 cm Muck (A10) **(LRR S)**
___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No __x__

Remarks:

Did not auger below 8 inches to avoid utility lines in the vicinity.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Wallops Pier City/County: Accomack Sampling Date: 8/31/2020

Applicant/Owner: NASA State: VA Sampling Point: WA-WET

Investigator(s): M. Batdorf and K. Nayda-St.Clair Section, Township, Range: ______

Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): None Slope (%): 0

Subregion (LRR or MLRA): MLRA 153D of LRR T Lat: 37.885133 Long: -75.437916 Datum: WGS84

Soil Map Unit Name: CaA - Camocca fine sand, 0 to 2 percent slopes, frequently flooded NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes x No ___	Is the Sampled Area within a Wetland? Yes x No ___
Hydric Soil Present?	Yes x No ___	
Wetland Hydrology Present?	Yes x No ___	

Remarks:

Data point taken within a wetland south of the runway and east of N Seawall Road.

Observed Classifications:

Cowardin: E2EM

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- x Surface Water (A1)
- x High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- x FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes x No ___	Depth (inches): 1	
Water Table Present?	Yes x No ___	Depth (inches): 3.5	
Saturation Present? (includes capillary fringe)	Yes x No ___	Depth (inches): 0	**Wetland Hydrology Present? Yes x No ___**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Surface water located adjacent to soil boring.

AECOM has prepared this form using "data-entered" copies of the wetland determination data form in Appendix C in the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region, Version 2.0, November 2010. The resulting data sheet uses the 2016 National Wetland Plant List (v3.3) Regional List and the 2019 Web Soil Survey.

VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: WA-WET

Tree Stratum (Plot size: 30 ft)

	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
5.			
6.			
	0 = Total Cover		

50% of total cover: 0 20% of total cover: 0

Sapling Stratum (Plot size: 30 ft)

	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
5.			
6.			
	0 = Total Cover		

50% of total cover: 0 20% of total cover: 0

Shrub Stratum (Plot size: 30 ft)

	Absolute % Cover	Dominant Species?	Indicator Status
1. Morella cerifera, Southern Bayberry	10	Yes	FAC
2.			
3.			
4.			
5.			
6.			
	10 = Total Cover		

50% of total cover: 5 20% of total cover: 2

Herb Stratum (Plot size: 30 ft)

	Absolute % Cover	Dominant Species?	Indicator Status
1. Phragmites australis, Common Reed	70	Yes	FACW
2. Chasmanthium laxum, Slender Wood-Oats	10	No	FACW
3. Setaria magna, Giant Bristle Grass	10	No	FACW
4. Smilax rotundifolia, Horsebrier	5	No	FAC
5. Toxicodendron radicans, Eastern Poison Ivy	5	No	FAC
6. Baccharis halimifolia, Groundseltree	5	No	FAC
7.			
8.			
9.			
10.			
11.			
	105 = Total Cover		

50% of total cover: 52.5 20% of total cover: 21

Woody Vine Stratum (Plot size: 30 ft)

	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
5.			
	0 = Total Cover		

50% of total cover: 0 20% of total cover: 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	90	x 2 = 180
FAC species	25	x 3 = 75
FACU species	0	x 4 = 0
UPL species	0	x 5 = 0
Column Totals:	115 (A)	255 (B)

Prevalence Index = B/A = 2.22

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes x No ___

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: WA-WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 2/1	100%					Loam	
5-18	10YR 4/2	60%	10YR 3/1	40%			Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Organic Bodies (A6) **(LRR P, T, U)**
___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
___ Muck Presence (A8) **(LRR U)**
___ 1 cm Muck (A9) **(LRR P, T)**
_x_ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Coast Prairie Redox (A16) **(MLRA 150A)**
___ Sandy Mucky Mineral (S1) **(LRR O, S)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7) **(LRR P, S, T, U)**
___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
___ Thin Dark Surface (S9) **(LRR S, T, U)**
___ Loamy Mucky Mineral (F1) **(LRR O)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Marl (F10) **(LRR U)**
___ Depleted Ochric (F11) **(MLRA 151)**
___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
___ Umbric Surface (F13) **(LRR P, T, U)**
___ Delta Ochric (F17) **(MLRA 151)**
___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) **(LRR O)**
___ 2 cm Muck (A10) **(LRR S)**
___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes _x_ **No** ___

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Wallops Pier City/County: Accomack Sampling Date: 8/31/2020

Applicant/Owner: NASA State: VA Sampling Point: WA-UPL

Investigator(s): M. Batdorf and K. Nayda-St.Clair Section, Township, Range: ____

Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): None Slope (%): 0

Subregion (LRR or MLRA): MLRA 153D of LRR T Lat: 37.885081 Long: -75.437979 Datum: WGS84

Soil Map Unit Name: ChA - Chincoteague silt loam, 0 to 1 percent slopes, very frequently flooded NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes x No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes x No ____	Is the Sampled Area within a Wetland? Yes ____ No x
Hydric Soil Present?	Yes ____ No x	
Wetland Hydrology Present?	Yes ____ No x	

Remarks:

Data point taken within upland adjacent to data point WA-WET. Hydrophytic vegetation passes dominance and prevalence tests due to facultative species.

Observed Classifications:
Cowardin: N/A

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ____	No x	Depth (inches): ____
Water Table Present?	Yes ____	No x	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No x	Depth (inches): ____

Wetland Hydrology Present? Yes ____ No x

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No hydrology indicators present

AECOM has prepared this form using "data-entered" copies of the wetland determination data form in Appendix C in the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region, Version 2.0, November 2010. The resulting data sheet uses the 2016 National Wetland Plant List (v3.3) Regional List and the 2019 Web Soil Survey.

VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: WA-UPL

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Pinus taeda, Loblolly Pine	75	Yes	FAC
2.			
3.			
4.			
5.			
6.			
	75 = Total Cover		

50% of total cover: 37.5 20% of total cover: 15

Sapling Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Juniperus virginiana, Eastern Red-Cedar	5	Yes	FACU
2. Prunus serotina, Black Cherry	5	Yes	FACU
3.			
4.			
5.			
6.			
	10 = Total Cover		

50% of total cover: 5 20% of total cover: 2

Shrub Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
5.			
6.			
	0 = Total Cover		

50% of total cover: 0 20% of total cover: 0

Herb Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Phragmites australis, Common Reed	10	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	10 = Total Cover		

50% of total cover: 5 20% of total cover: 2

Woody Vine Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Smilax rotundifolia, Horsebrier	75	Yes	FAC
2.			
3.			
4.			
5.			
	75 = Total Cover		

50% of total cover: 37.5 20% of total cover: 15

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	10	x 2 =	20
FAC species	150	x 3 =	450
FACU species	10	x 4 =	40
UPL species	0	x 5 =	0
Column Totals:	170 (A)		510 (B)

Prevalence Index = B/A = 3.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes x No ___

Remarks: (If observed, list morphological adaptations below).

Data point passes dominance and prevalence tests due to high number of facultative species.

SOIL Sampling Point: WA-UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 3/3	100%					Sand	
3-16	10YR 3/4	100%					Sand	
16-18	10YR 4/4	100%					Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Organic Bodies (A6) **(LRR P, T, U)**
___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
___ Muck Presence (A8) **(LRR U)**
___ 1 cm Muck (A9) **(LRR P, T)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Coast Prairie Redox (A16) **(MLRA 150A)**
___ Sandy Mucky Mineral (S1) **(LRR O, S)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7) **(LRR P, S, T, U)**
___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
___ Thin Dark Surface (S9) **(LRR S, T, U)**
___ Loamy Mucky Mineral (F1) **(LRR O)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Marl (F10) **(LRR U)**
___ Depleted Ochric (F11) **(MLRA 151)**
___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
___ Umbric Surface (F13) **(LRR P, T, U)**
___ Delta Ochric (F17) **(MLRA 151)**
___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) **(LRR O)**
___ 2 cm Muck (A10) **(LRR S)**
___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes ___ No x

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Wallops Pier City/County: Accomack Sampling Date: 8/31/2020

Applicant/Owner: NASA State: VA Sampling Point: WB-WET

Investigator(s): M. Batdorf and K. Nayda-St.Clair Section, Township, Range: ______

Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): None Slope (%): 0

Subregion (LRR or MLRA): MLRA 153D of LRR T Lat: 37.885707 Long: -75.438387 Datum: WGS84

Soil Map Unit Name: CaA - Camocca fine sand, 0 to 2 percent slopes, frequently flooded NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes x No ___	Is the Sampled Area within a Wetland? Yes x No ___
Hydric Soil Present?	Yes x No ___	
Wetland Hydrology Present?	Yes x No ___	

Remarks:
Data point taken with a high marsh downslope of the runway.

Observed Classifications:
Cowardin: E2EM

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- x High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- x Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- x FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ___	No x	Depth (inches): ___
Water Table Present?	Yes x	No ___	Depth (inches): 3
Saturation Present? (includes capillary fringe)	Yes x	No ___	Depth (inches): 0

Wetland Hydrology Present? Yes x No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

AECOM has prepared this form using "data-entered" copies of the wetland determination data form in Appendix C in the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region, Version 2.0, November 2010. The resulting data sheet uses the 2016 National Wetland Plant List (v3.3) Regional List and the 2019 Web Soil Survey.

VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: WB-WET

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
5.			
6.			
	0 = Total Cover		
50% of total cover: 0	20% of total cover: 0		

Sapling Stratum (Plot size: 30 ft)			
1. N/A			
2.			
3.			
4.			
5.			
6.			
	0 = Total Cover		
50% of total cover: 0	20% of total cover: 0		

Shrub Stratum (Plot size: 30 ft)			
1. Iva frutescens, Jesuit's-Bark	40	Yes	FACW
2. Morella cerifera, Southern Bayberry	10	Yes	FAC
3.			
4.			
5.			
6.			
	50 = Total Cover		
50% of total cover: 25	20% of total cover: 10		

Herb Stratum (Plot size: 30 ft)			
1. Spartina patens, Salt-Meadow Cord Grass	80	Yes	FACW
2. Bolboschoenus robustus, Saltmarsh Bulrush	10	No	OBL
3. Distichlis spicata, Coastal Salt Grass	10	No	OBL
4. Panicum virgatum, Wand Panic Grass	10	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	110 = Total Cover		
50% of total cover: 55	20% of total cover: 22		

Woody Vine Stratum (Plot size: 30 ft)			
1. N/A			
2.			
3.			
4.			
5.			
	0 = Total Cover		
50% of total cover: 0	20% of total cover: 0		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	20	x 1 = 20
FACW species	120	x 2 = 240
FAC species	20	x 3 = 60
FACU species	0	x 4 = 0
UPL species	0	x 5 = 0
Column Totals:	160 (A)	320 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes x No ___

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: WB-WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/1	100%					Sand	
4-11	10YR 4/2	85%	7.5YR 3/4	15%	C	M	Sand	
11-18	10YR 3/1	95%	10YR 3/6	5%	C	M	Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- x Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______________________

Depth (inches): ______________________

Hydric Soil Present? Yes x No ______

Remarks:

Appendix C: Representative Photographs

Project: Wallops Pier Project Number: 60617789	PHOTOGRAPH LOG
Client: National Aeronautics and Space Administration	

Photo ID: **A**	Date: 07/28/2020	
Location: 37.883677, -75.434698 Description: View of non-hydric soil, from a depth of 0 – 18 inches, present at data point UPL Hangar, southeast of the hangar and runway.		

Photo ID: **B**	Date: 07/28/2020	
Location: 37.883675, -75.43466 Description: View, facing south, of typical vegetation present at data point UPL Hangar.		

AECOM

Project: Wallops Pier Project Number: 60617789	**PHOTOGRAPH LOG**
Client: National Aeronautics and Space Administration	

Photo ID: **C**	Date: 08/31/2020
Location: 37.885117, -75.437914 Description: View of hydric soil, from a depth of 0 – 18 inches, at determination point WA-WET within wetland WA.	

Photo ID: **D**	Date: 08/31/2020
Location: 37.885169, -75.437902 Description: View, facing northeast, of typical vegetation present at determination point WA-WET within wetland WA.	

AECOM

Project: Wallops Pier Project Number: 60617789	PHOTOGRAPH LOG
Client: National Aeronautics and Space Administration	

Photo ID: E	Date: 08/31/2020
Location: 37.885112, -75.43807 Description: View of non-hydric soil, from a depth of 0 – 18 inches, present at determination point WA-UPL adjacent to wetland WA.	

Photo ID: F	Date: 08/31/2020
Location: 37.885115, -75.438042 Description: View, facing west, of typical vegetation present at determination point WA-UPL adjacent to wetland WA.	

AECOM

Project: Wallops Pier Project Number: 60617789 Client: National Aeronautics and Space Administration	**PHOTOGRAPH LOG**

Photo ID: **G**	Date: 08/31/2020
Location: 37.885724, -75.438394 Description: View of hydric soil, from a depth of 0 – 18 inches, at determination point WB-WET within wetland WB.	

Photo ID: **H**	Date: 08/31/2020
Location: 37.885715, -75.438381 Description: View, facing southwest, of typical high marsh vegetation found at determination point WB-WET and within wetland WB.	

AECOM

Wetland Delineation Report

UAS Airstrip Roadway

Wallops Flight Facility

Wallops Island, VA (Accomack County)

COASTAL VIRGINIA

ENVIRONMENTAL SERVICES

Prepared for:

GMB Architects & Engineers

206 West Main Street

Salisbury, MD 21801

Prepared by:

Rick Harris

VA PWD #: 3402000173

COVA Environmental

4409 Segovia Court

Virginia Beach, VA 23462

January 14, 2021

COVA ENVIRONMENTAL

Table of Contents

APPENDICES

1 Introduction and Executive Summary

Coastal Virginia Environmental Services, Inc. (COVA Environmental) has been contracted by GMB Architects & Engineers to complete a wetland delineation for a study area located near N Seawall Road within the northern portion of Wallops Island, VA. The study area is approximately 0.645 acres and consists of the culverted crossing (and its immediate vicinity) for the UAS Airstrip roadway access that is located approximately 650 feet south of the UAS Airstrip. The study area contains a portion of the UAS Airstrip roadway, a culverted stream crossing, and estuarine wetlands located to the west and east of the roadway access.

COVA Environmental personnel conducted the site investigation for the wetland delineation on January 13, 2021. Our initial findings from the wetland delineation identified approximately 0.519 cumulative acres of estuarine wetlands (E2EM1P) within the study area. Approximately 0.126 acres of uplands were observed and consisted of the roadway, the culverted stream crossing, and the sloped shoulder along the roadway. An estuarine stream was observed within the estuarine wetlands that intersected the roadway via the culverted crossing. Approximately 151 cumulative linear feet of estuarine stream channel (E1UBL) was observed within the study area. The identified wetland limits are considered preliminary until ultimately confirmed by the U.S. Army Corps of Engineers (USACE) through a jurisdictional determination. However, the limits of wetlands and Waters of the U.S. features depicted within Exhibit 2, Appendix 3 illustrate the flagged areas observed by COVA Environmental during the site investigation.

The wetland delineation was completed using the routine determination method found in the *1987 Corps of Engineers Wetlands Delineation Manual* and in accordance with procedures and criteria described in the *Atlantic and Gulf Coastal Plain Regional Supplement (Version 2, Nov. 2010)*. The methodology used for the wetland delineation is designed to determine whether portions of the study area meet all three technical parameters for wetland classification; these three technical parameters consist of wetland hydrology, hydrophytic vegetation, and hydric soil. Prior to completing the field investigation portion of the wetland delineation, COVA Environmental conducted extensive research of all available background resources to gain a better understanding of the study area and its vicinity. These background resources include the USGS topographic map, USFWS National Wetlands Inventory mapping, local Soil Survey provided by NRCS, LiDAR elevation data, and other available sources. The data obtained from the field investigation and background resources was analyzed thoroughly to complete the wetland delineation and determine the limits of wetlands within the study area. The data, analysis, and findings are described in detail below.

2 Background Research

2.1 USGS Topographical Map

The *USGS Chincoteague West Topographical Quadrangle* was used to produce the topographical map (Exhibit 1, Appendix 3) that illustrates many details of the study area and its vicinity. The study area is depicted at an elevation ranging between 0 to 5 feet above sea level. A roadway is depicted running through the center of the study area, intersecting the study area in a north-south orientation. This roadway continues offsite to the north and south. The roadway is illustrated as being surrounded by wetlands that connect to the larger wetland system located to the west. A stream is illustrated within the center of the study area, intersecting the in an east-west orientation. The roadway appears to cross this stream within the center of the study area. The stream is located within the wetlands and appears to slope down gradient in a western direction eventually drains into the Chincoteague Inlet. The Chincoteague Inlet connects directly to the Atlantic Ocean. These topographical maps are produced by COVA Environmental in part to gain a better understanding of the study area's landscape and its connection with the vicinity. Also, this topographical map was last updated in 1986 and was selected in part to provide additional historical context regarding the study area and its vicinity. Therefore, site conditions exhibited in this map may have changed.

2.2 LiDAR Map

Light Detection and Ranging (LiDAR) data is typically gathered by an airborne system that measures distances between ground features and the on-board sensor with pulsed laser lights. These measurements of the laser light return data are used to create 3D representations of ground features like houses and trees and can also accurately depict soil surface characteristics to display elevation, slope, and gradients across a given landscape. LiDAR maps can be particularly useful for wetland delineations by identifying low-laying areas, flat landscapes, streams, and many other aspects associated with wetland identification. The LiDAR data obtained for the LiDAR map (Exhibit 3, Appendix 3) has been enhanced to illustrate elevations through a color spectrum with the lower elevations in blue and the higher elevations in red. The LiDAR data exhibits similar conditions observed within the USGS topographical map. The study area overall contains a low-laying, flat landscape that is illustrated with blue colors. A linear drainage feature (dark blue color) appears to intersect the study area in an east-west orientation draining in a western direction. A linear feature containing higher elevations (green and light blues) is illustrated as intersecting the study area in a north-south orientation. This feature appears to cross the linear drainage.

2.3 National Wetlands Inventory Map

The National Wetlands Inventory (NWI) is produced by the U.S. Fish and Wildlife Service (USFWS) with digital map data and other resources to provide the public with an estimate of the nation's total wetland resources. The NWI mapped wetlands are displayed by wetland classification and illustrate the extent of each wetland class. It is important to note that the USFWS issues a limitation disclaimer on this data that states their mapped wetland resources are prepared from the analysis of high-altitude imagery and a margin of error is inherent in the use of imagery. Thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis. The NWI map produced by COVA Environmental (Exhibit 4, Appendix 3) identifies three wetland classes throughout the study area. PSS3/EM1C is a palustrine wetland class that contains both a scrub-shrub landscape and a landscape dominated by emergent vegetation. The dominant vegetation within the scrub-shrub landscape is dominated by broad-leaved evergreen vegetation. The emergent vegetation is dominated by persistent herbaceous hydrophytes that normally remain standing at least until the beginning of the next growing season. The water regime for this wetland class is characterized as seasonally flooded, meaning surface water is present for extended periods especially early in the growing season, but absent by the end of the growing season in most years. The water table after flooding ceases is variable, extending from saturated to the surface to a water table well below the ground surface. E2EM1P6 is an estuarine wetland class that is located within the intertidal zone, meaning the substrate in these habitats is flooded and exposed by tides. The landscape is dominated by emergent vegetation that contain persistent herbaceous hydrophytes that normally remain standing at least until the beginning of the next growing season. The water regime is characterized as irregularly flooded, meaning tides flood the substrate less often than daily. The water chemistry for this wetland class is characterized as oligohaline, meaning the water contains salinity levels between 0.5 and 5 ppt. E2EM1N is an estuarine wetland class that is located within the intertidal zone, meaning the substrate in these habitats is flooded and exposed by tides. The landscape is dominated by emergent vegetation that contain persistent herbaceous hydrophytes that normally remain standing at least until the beginning of the next growing season. The water regime is characterized as regularly flooded, meaning tides alternately flood and expose the substrate at least once daily.

2.4 NRCS Soil Survey Map

Soil Surveys are produced by the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS). The NRCS Soil Survey map (Exhibit 5, Appendix 3) created by COVA Environmental displays GIS soil survey data and information procured from the NRCS. This soil survey data is provided in part to assist landowners for silvicultural, agricultural, and other developmental activities. The soil survey map data for Accomack County, VA obtained from the NRCS lists two soil series within the study area. The Camocca fine sand (Soil Map Unit: CaA) is a 0 to 2 percent sloped soil that is composed of 95 percent Camocca/similar soils and 2 percent minor components. The typical Camocca soil profile is characterized as having fine sandy layers from the soil surface down to approximately 85 inches below the soil surface. This soil series is typically found within depressional landforms and is comprised of eolian sand. The natural drainage class of this soil series is rated as poorly drained that is frequently flooded. The Chincoteague silt loam (Soil Map Unit: ChA) is a 0 to 1 percent sloped soil that is composed of 90 percent Chincoteague/similar soils and 10 percent minor components. The typical Chincoteague soil profile is characterized as having a silt loam surface layer down to approximately 10 inches below the soil surface, a silty clay loam layer from 10 to 40 inches below the soil surface, and underlain by a silt loam layer from 40 to 65 inches below the soil surface. This soil series is typically found within salt marsh landforms and is comprised marine deposits. The natural drainage class of this soil series is rated as very poorly drained that is very frequently flooded. Both soil series are listed on the NRCS's list of hydric soils for Accomack County, VA meaning they possess the potential to be hydric.

3 Wetland Delineation Findings

3.1 Estuarine Wetlands

The wetland delineation field investigation resulted in identifying and flagging approximately 0.519 acres of estuarine wetlands (Cowardin Classification: E2EM1P) throughout the study area. These estuarine wetlands were observed along the eastern and western side of the roadway and began along the toe slope of the vegetated roadway shoulder. A tidal salt marsh landscape dominated the landscape within the estuarine wetlands and were drained by the stream observed in the center of the study area. The estuarine wetlands appeared to mostly be located within the high marsh zone with a narrow low marsh zone located near the stream.

The dominant vegetation within the estuarine wetlands consisted of marsh elder (*Iva frutescens*), saltmeadow cordgrass (*Spartina patens*), and smooth cordgrass (*Spartina alterniflora*). The hydrophytic vegetation parameter was met throughout all the estuarine wetlands observed within the study area by the dominance test. The soil profiles throughout the estuarine wetlands displayed low chroma colors and redoximorphic features (reduced iron) began near the soil surface. A presence of muck was observed within the upper 2 inches of the soil surface throughout the estuarine wetlands. A hydrogen sulfide odor was observed from the soil indicating the likely presence of persistent anaerobic conditions. The hydrogen sulfide, muck presence, 1cm muck, sandy mucky mineral, sandy redox, and depleted matrix hydric soil indicators were observed throughout the estuarine wetlands. The hydric soil parameter was met throughout the estuarine wetlands. The surface water, high water table, saturation, aquatic fauna, hydrogen sulfide odor, and oxidized rhizospheres along living roots primary wetland hydrology indicators and drainage patterns, geomorphic position, and FAC-Neutral test secondary wetland hydrology indicators were observed. The wetland hydrology parameter was met throughout the estuarine wetlands. The hydrology was consistent with that of a tidal salt marsh. Surface water was located within large pockets across the landscape that drained towards the estuarine stream.

3.2 Estuarine Stream and Culverted Crossing

An estuarine stream (Cowardin Classification: E1UBL) was observed in the center of the study area and accounted for approximately 151 cumulative linear feet of stream channel within the study area. This estuarine stream was surrounded by estuarine wetlands and sloped down gradient in a western direction towards the tributaries of Chincoteague Inlet. The stream was subtidal and exhibited water flowing in an eastern direction with the tide flooding in and water flowing in a western direction with the tide ebbing out. Aquatic fauna including fish, crabs, mollusks, etc. were observed throughout the stream. The stream contained an unconsolidated bottom and appeared to be continuously covered by tidal salt water. The roadway perpendicularly intersected the stream via of a culverted crossing.

The culverted crossing consisted of a 24-inch diameter corrugated HDPE pipe that hydrologically connected the stream on both sides of the roadway. The pipe from end to end was approximately 29 linear feet long. The crossing was structurally supported by a retaining wall that was backfilled with stone between the retaining wall and the roadway. The wetland line was determined to be located along the retaining wall that separated the estuarine wetlands from the upland roadway shoulder that contained the backfill materials.

3.3 Upland Roadway and Shoulder

The uplands observed during the wetland delineation consisted of a paved roadway and its vegetated shoulder located on both sides of the roadway. These uplands accounted for approximately 0.126 acres of the study area. The paved roadway was situated along a convex landscape with a sloped shoulder that was vegetated and appeared to be effectively drained due to its convex relief. Both the roadway and shoulder are positioned a few feet higher than the adjacent wetlands that began at the toe slope of the shoulder. The soil profile along the roadway shoulder exhibited what appeared to be sandy fill materials that covered the former soil surface. The soil and hydrological conditions observed along the roadway ultimately qualified this area as uplands.

The dominant vegetation within the uplands consisted of eastern Baccharis (*Baccharis halimifolia*), saltmeadow cordgrass (*Spartina patens*), and fescue (*Schedonorus arundinaceus*). The dominance test was met within the uplands and therefore meets the hydrophytic vegetation parameter. The vegetation near the roadway appeared to be routinely mowed and therefore the vegetation in the mowed areas was difficult to analyze. The soil profile displayed high chroma colored sandy layers within the upper 22 inches of the soil surface. Redoximorphic features (reduced iron) began at approximately 14 inches below the soil surface. A low chroma colored layer was observed beyond 22 inches below the soil surface. This darker colored layer appeared to be the former soil surface due to its similar characteristics to the soil profiles observed in the nearby wetlands that are outside of the roadway area. This former surface layer has most likely been buried by fill materials that were deposited for the shoulder of the paved roadway. No hydric soil indicators were observed, and the hydric soil parameter was not met. The FAC-Neutral test secondary wetland hydrology indicator was the only wetland hydrology indicator observed in the uplands due to the *Spartina patens* that encroached within the uplands. The wetland hydrology parameter was not met.

4 Conclusions

The wetland delineation determined that the study area possesses approximately 0.519 cumulative acres of estuarine wetlands (E2EM1P) within the study area. Approximately 0.126 acres of uplands were observed and consisted of the roadway, the culverted stream crossing, and the sloped shoulder along the roadway. An estuarine stream was observed within the estuarine wetlands that intersected the roadway via the culverted crossing. Approximately 151 cumulative linear feet of estuarine stream channel (E1UBL) was observed within the study area. The wetland limits are illustrated in Exhibit 2, Appendix 3. These wetland limits are considered preliminary until ultimately confirmed by the U.S. Army Corps of Engineers (USACE). Therefore, COVA Environmental recommends coordination with the USACE to confirm these wetland limits and issue their jurisdictional determination. The wetland limits are subject to modification upon USACE confirmation.

Jurisdictional wetlands are regulated under section 404 and 401 of the Clean Water Act. Filling, excavating, grading, and other activities in wetlands require permits from appropriate government agencies. Unauthorized activity in wetlands is subject to violation.

Appendix 1: Site Information

Wetland Delineation Site Information

UAS Airstrip Roadway Wetland Delineation
Tax Parcel 02800A000007500
(0.645-acre study area)
Wallops Island, VA

Latitude/ Longitude in Decimal Degrees using coordinate plane (NAD 1983)
37.883905° North / -75.438495° West (center of study area)

Has a previous delineation or JD been performed?
NAO-2011-0424, Timmons Group "UAS Airfield at WFF" April 3, 2009

Hydrologic Unit Code (HUC)
8-Digit HUC – 02040303 (Chincoteague)
10-Digit HUC – 0204030305 (Lower Chincoteague Bay)
12-Digit HUC – 020403030504 (Chincoteague Bay-Chincoteague Inlet)

USGS Topographic Sheet
USGS Chincoteague West, VA Topographical Quadrangle

Nearest Waterbody
The nearest named waterbody is Chincoteague Bay/Inlet located approximately 3,000 feet to the north.

Delineation Methods
- U.S. Army Corps of Engineers 1987 Wetland Delineation Manual in conjunction with Atlantic and Gulf Coastal Plain Regional Supplement (Version 2, Nov. 2010)
- Atlantic and Gulf Coastal Plain 2018 Regional Wetland Plant List (version 3.4)

On-Site Investigation Date
Wetland boundary delineation and site data collection conducted on January 13, 2021

Wetland Delineation Plan
The proposed wetland boundaries and Data Sampling Point locations are depicted on the plan entitled Exhibit 2: Site Map prepared by Rick Harris on January 14, 2021

Wetlands
The wetland delineation field investigation resulted in identifying and flagging approximately 0.519 acres of estuarine wetlands (Cowardin Classification: E2EM1P) throughout the study area. These estuarine wetlands were observed along the eastern and western side of the roadway and began along the toe slope of the vegetated roadway shoulder. A tidal salt marsh landscape dominated the landscape within the estuarine wetlands and were drained by the stream observed in the center of the study area. The estuarine wetlands appeared to mostly be located within the high marsh zone with a narrow low marsh zone located near the stream.

Stream Channels
An estuarine stream (Cowardin Classification: E1UBL) was observed in the center of the study area and accounted for approximately 151 cumulative linear feet of stream channel within the study area. This estuarine stream was surrounded by estuarine wetlands and sloped down gradient in a western direction towards the tributaries of Chincoteague Inlet. The stream was subtidal and exhibited water flowing in an eastern direction with the tide flooding in and water flowing in a western direction with the tide ebbing out. Aquatic fauna including fish, crabs, mollusks, etc. were observed throughout the stream. The stream contained an unconsolidated bottom and appeared to be continuously covered by tidal salt water. The roadway perpendicularly intersected the stream via of a culverted crossing.

Uplands
The uplands observed during the wetland delineation consisted of a paved roadway and its vegetated shoulder located on both sides of the roadway. These uplands accounted for approximately 0.126 acres of the study area. The paved roadway was situated along a convex landscape with a sloped shoulder that was vegetated and appeared to be effectively drained due to its convex relief. Both the roadway and shoulder are positioned a few feet higher than the adjacent wetlands that began at the toe slope of the shoulder. The soil profile along the roadway shoulder exhibited what appeared to be sandy fill materials that covered the former soil surface. The soil and hydrological conditions observed along the roadway ultimately qualified this area as uplands.

100-Year Floodplains
As depicted on the Federal Emergency Management Agency's (FEMA) on-line Flood Insurance Rate Map #51001C0265G, effective on 05/18/2015, the study area is located within Zone VE with a base flood elevation of 9 feet. Zone VE is characterized as a coastal area with a high risk for flooding and an additional hazard associated with storm waves.

National Wetlands Inventory
The NWI map produced by COVA Environmental (Exhibit 4, Appendix 3) identifies three wetland classes throughout the study area: PSS3/EM1C, E2EM1P6, and E2EM1N. Further information regarding these wetland classes are described within section 2.3 of the included report.

USDA NRCS Soil Survey
The soil survey map data for Accomack County, VA obtained from the NRCS lists two soil series within the study area: Camocca fine sand (Soil Map Unit: CaA) and Chincoteague silt loam (Soil Map Unit: ChA). Both soil series are listed on the NRCS's list of hydric soils for Accomack County, VA meaning they possess the potential to be hydric. Soil survey information for the study area is described in detail within section 2.4 of the included report and illustrated in Exhibit 5, Appendix 3. The full soil series information obtained form the USDA's NRCS for all identified soils within the study area are included with this site information summary.

Waters Table:

Wetland/Water	Latitude	Longitude	Cowardin Class	Area (Acres) / Length (feet)	Tidal / Non-Tidal
1	37.884012°N	-75.438634°W	E2EM1P	0.222 acres	Tidal
2	37.883944°N	-75.438317°W	E2EM1P	0.297 acres	Tidal
3	37.883934°N	-75.438643°W	E1UBL	73 liner feet	Tidal
4	37.883886°N	-75.438330°W	E1UBL	78 liner feet	Tidal

Waters Table Notes:

The #1 wetland feature consists of the estuarine wetlands identified and flagged west of the roadway.

The #2 wetland feature consists of the estuarine wetlands identified and flagged east of the roadway.

The #3 waters feature consists of the estuarine stream identified west of the roadway.

The #4 waters feature consists of the estuarine stream identified east of the roadway.

National Flood Hazard Layer FIRMette

FEMA

75°26'36"W 37°53'12"N

75°25'59"W 37°52'44"N

Feet 0 250 500 1,000 1,500 2,000

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- B 20.2 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 6/27/2023 at 11:00 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Accomack County, Virginia

CaA—Camocca fine sand, 0 to 2 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 3yvy
Elevation: 0 to 10 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 200 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Camocca and similar soils: 95 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Camocca

Setting

Landform: Depressions
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian sand

Typical profile

H1 - 0 to 6 inches: fine sand
H2 - 6 to 85 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Very high (19.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water capacity: Very low (about 2.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Minor Components

Chincoteague

Percent of map unit: 2 percent

Landform: Salt marshes
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Accomack County, Virginia
Survey Area Data: Version 16, Jun 3, 2020

Accomack County, Virginia

ChA—Chincoteague silt loam, 0 to 1 percent slopes, very frequently flooded

Map Unit Setting

National map unit symbol: 2v9nb
Elevation: 0 to 80 feet
Mean annual precipitation: 40 to 59 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 200 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Chincoteague and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chincoteague

Setting

Landform: Salt marshes
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Marine deposits

Typical profile

A - 0 to 10 inches: silt loam
Cg1 - 10 to 40 inches: silty clay loam
Cg2 - 40 to 65 inches: silt loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Very frequent
Frequency of ponding: None
Maximum salinity: Strongly saline (90.0 to 230.0 mmhos/cm)
Sodium adsorption ratio, maximum: 70.0
Available water capacity: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Magotha

Percent of map unit: 5 percent
Landform: Salt marshes
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Camocca

Percent of map unit: 3 percent
Landform: Depressions on interdunes
Landform position (three-dimensional): Dip, talf
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Nimmo

Percent of map unit: 2 percent
Landform: Dunes
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: Yes

Data Source Information

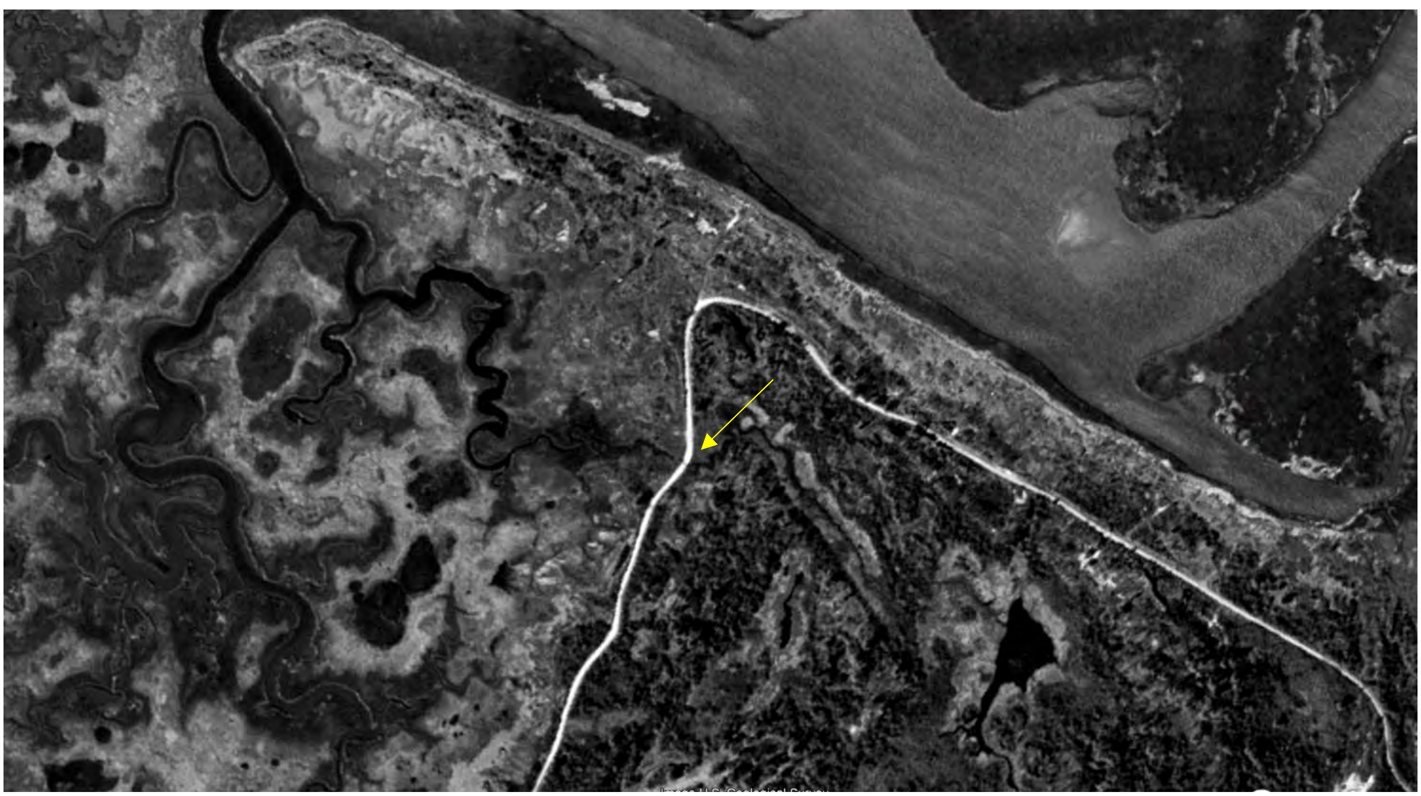
Soil Survey Area: Accomack County, Virginia
Survey Area Data: Version 16, Jun 3, 2020


2016


2013

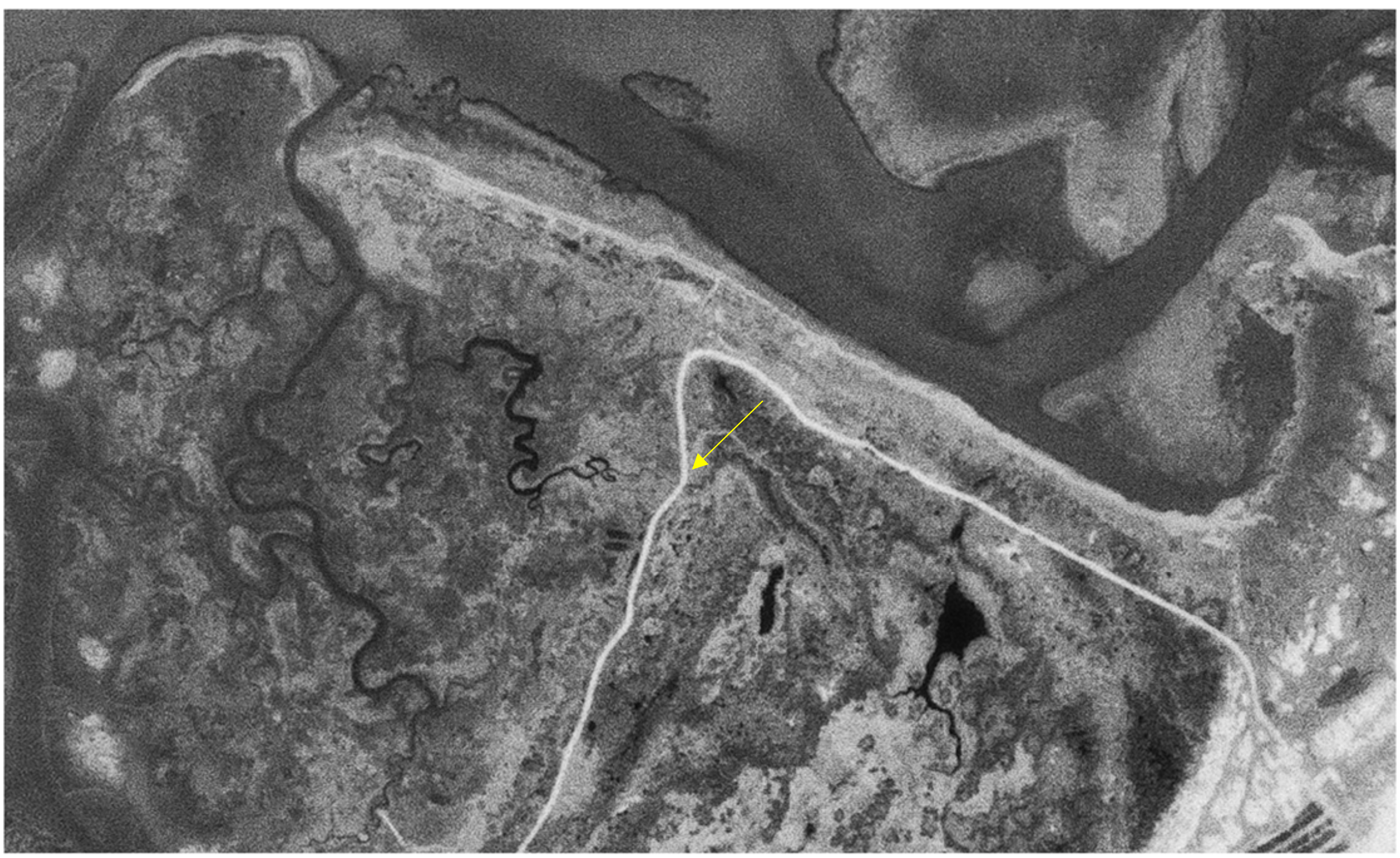
UAS Airstrip Historical Aerial Photography
Source: Google Earth, United States Geological Survey


2007


1994

UAS Airstrip Historical Aerial Photography
Source: Google Earth, United States Geological Survey

1977



1973

UAS Airstrip Historical Aerial Photography
Source: Google Earth, United States Geological Survey

1963

1959

UAS Airstrip Historical Aerial Photography
Source: Google Earth, United States Geological Survey

Appendix 2: Photographs

Photograph 1: Representative view of the estuarine wetlands in the southeast portion of the study area

Photograph 2: Representative view of the estuarine wetlands in the western portion of the study area

Photograph 3: Representative view of the estuarine stream within the study area

Photograph 4: Typical view of wetland flag located along the roadway shoulder

Photograph 5: Representative view of the roadway within the study area

Photograph 6: Roadway culverted stream crossing

Photograph 7: Typical view of wetland line located directly above retaining wall

Photograph 8: Eastern side of culverted stream crossing

Photograph 9: Western side of culverted stream crossing

Photograph 10: Representative view of upland vegetated shoulder along roadway

Photograph 11: Soil profile of upland roadway shoulder exhibiting sandy fill materials

Appendix 3: Exhibit Maps

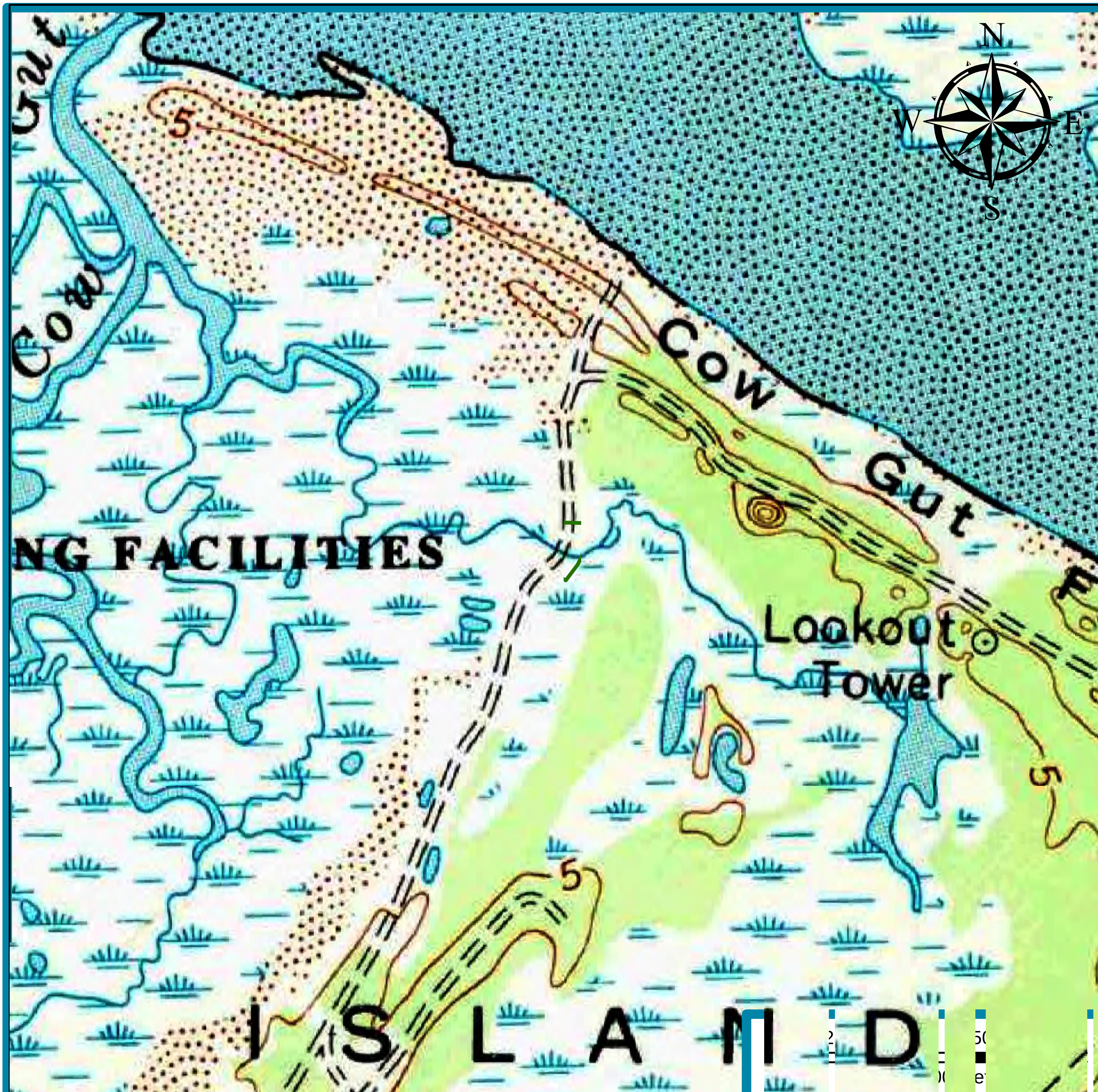
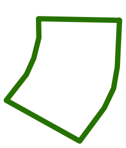


Exhibit 1: USGS Topographical Map, UAS Airstrip Wetland Delineation, Wallops Island, VA

Source: USGS Chincoteague West, VA 1986 Topographical Quadrangle

Legend



Study Area ~ 0.645 acres

COVA Project #: 2020-032
Date: 01/11/2021
Created By: Rick Harris
VA PWD #: 3402000173

COASTAL VIRGINIA ENVIRONMENTAL SERVICES

Exhibit 2: Site Map, UAS Airstrip Wetland Delineation, Wallops Island, VA

Source: VGIN 2017 Aerial Basemap; Delineation Data Collected via Trimble R1 GNSS Receiver

Legend

Study Area ~ 0.645 acres

E2EM1P Wetlands ~ 0.519 cumulative acres

E1UBL Stream ~ 151 cumulative linear feet

Culvert Pipe ~ 29 linear feet

Data Point

COVA Project #: 2020-032
Date: 01/14/2021
Created By: Rick Harris
VA PWD #: 3402000173

COASTAL VIRGINIA ENVIRONMENTAL SERVICES

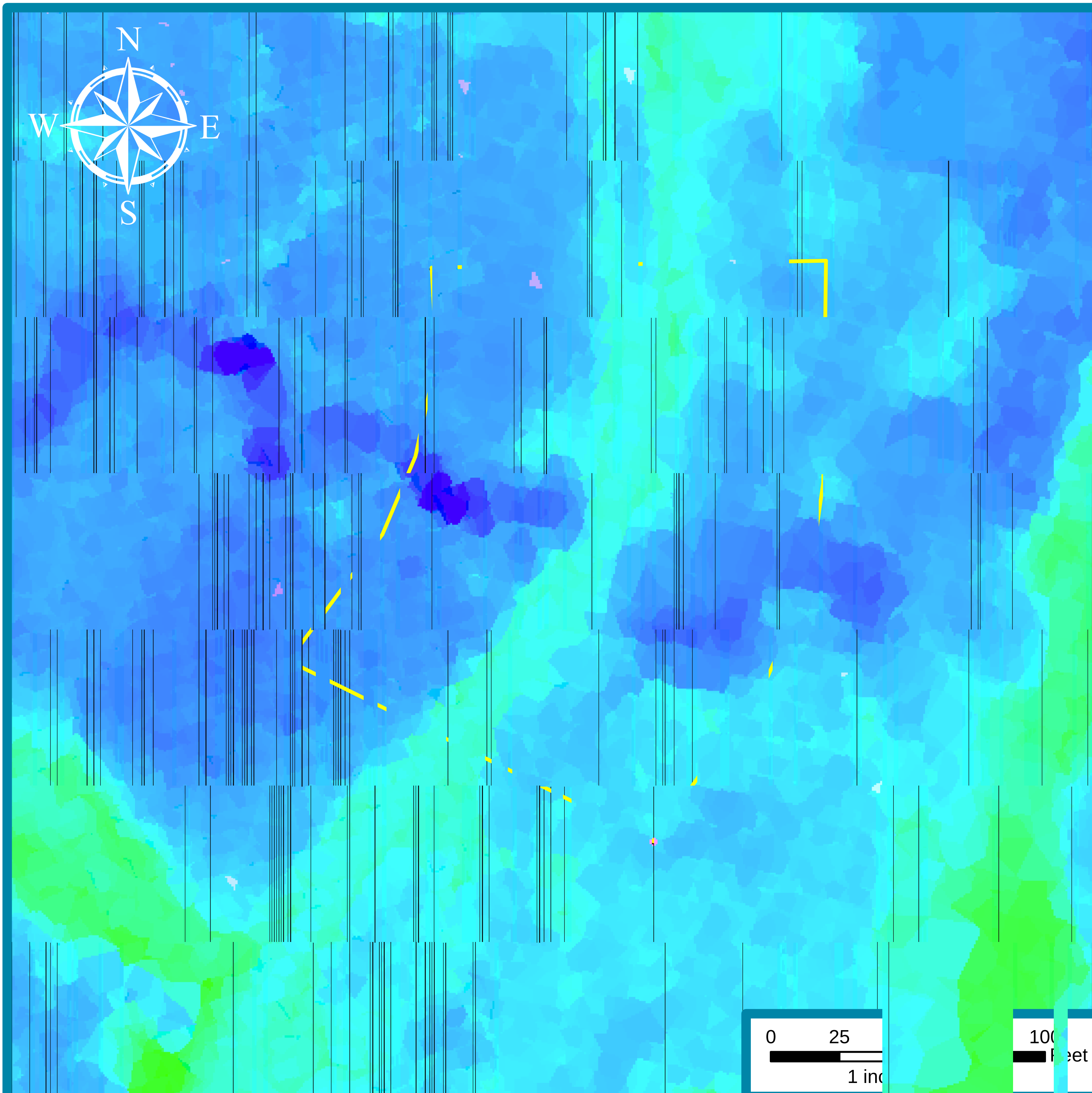


Exhibit 3: LiDAR Map, UAS Airstrip Wetland Delineation, Wallops Island, VA

Source: USGS LPC VA Eastern Shore 2010 LAS LiDAR Data

Legend

Study Area ~ 0.645 acres

Elevation

Lower

Higher

COVA Project #: 2020-032
Date: 01/11/2021
Created By: Rick Harris
VA PWD #: 3402000173

COASTAL VIRGINIA
ENVIRONMENTAL SERVICES

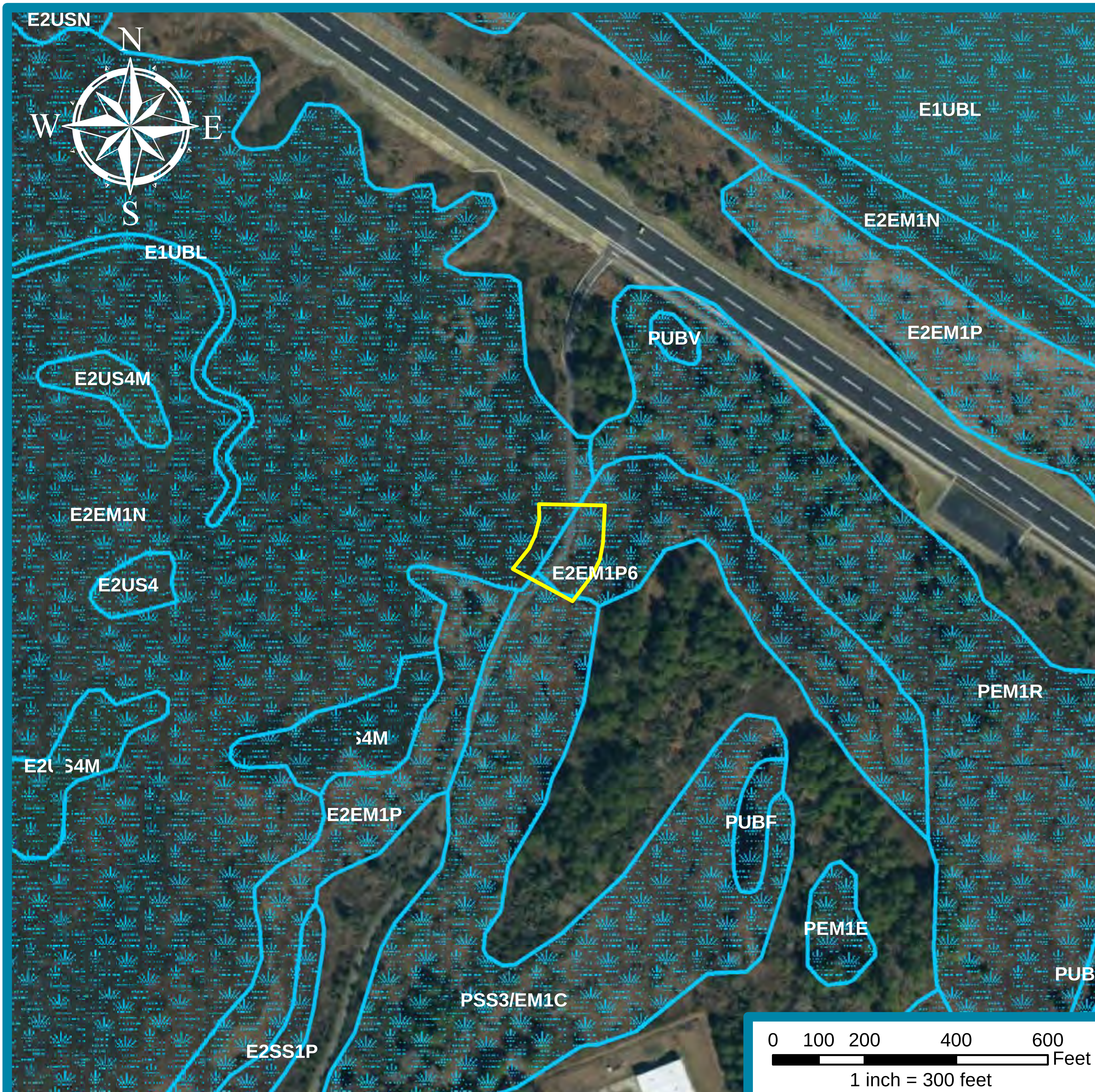


Exhibit 4: National Wetlands Inventory Map, UAS Airstrip Wetland Delineation, Wallops Island, VA

Source: VGIN 2017 Aerial Basemap; USFWS NWI shapefile for Virginia

Legend

Study Area ~ 0.645 acres

NWI Wetland Areas
(by wetland class)

COVA Project #: 2020-032
Date: 01/11/2021
Created By: Rick Harris
VA PWD #: 3402000173

COASTAL VIRGINIA
ENVIRONMENTAL SERVICES

Exhibit 5: NRCS Soil Survey Map, UAS Airstrip Wetland Delineation, Wallops Island, VA

Source: VGIN 2017 Aerial Basemap; NRCS Soil Survey shapefile for Accomack County, VA

Legend

Study Area ~ 0.645 acres

Soil Map Unit Boundary

COVA Project #: 2020-032
Date: 01/11/2021
Created By: Rick Harris
VA PWD #: 3402000173

COASTAL VIRGINIA
ENVIRONMENTAL SERVICES

Appendix 4: Data Forms

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: UAS Airstrip Roadway City/County: Wallops Island, VA (Accomack County) Sampling Date: 01/13/2021

Applicant/Owner: GMB Architects & Engineers State: VA Sampling Point: DP1

Investigator(s): COVA Environmental (Rick Harris) Section, Township, Range: ______

Landform (hillslope, terrace, etc.): salt marsh Local relief (concave, convex, none): none - flat Slope (%): 0-1

Subregion (LRR or MLRA): LRR T Lat: 37.883709° N Long: -75.438506° W Datum: ______

Soil Map Unit Name: CaA—Camocca fine sand, 0 to 2 percent slopes, frequently flooded NWI classification: E2EM1P

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ____	**Is the Sampled Area within a Wetland?** **Yes** ✓ **No** ____
Hydric Soil Present?	Yes ✓ No ____	
Wetland Hydrology Present?	Yes ✓ No ____	

Remarks:

The hydrophytic vegetation, hydric soil, and wetland hydrology parameters were met. This area consisted of estuarine wetlands situated across a tidal salt marsh landscape.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☑ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☑ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☑ Hydrogen Sulfide Odor (C1)
- ☑ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☑ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ✓	No ____	Depth (inches): 2"
Water Table Present?	Yes ✓	No ____	Depth (inches): 0"
Saturation Present? (includes capillary fringe)	Yes ✓	No ____	Depth (inches): 0"

Wetland Hydrology Present? Yes ✓ **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

The Surface Water (A1), High Water Table (A2), Saturation (A3), Aquatic Fauna (B13), Hydrogen Sulfide Odor (C1), and Oxidized Rhizospheres along Living Roots (C3) primary wetland hydrology indicators were observed. The Drainage Patterns (B10), Geomorphic Position, (D2) and FAC-Neutral Test (D5) secondary wetland hydrology indicators were observed. The wetland hydrology parameter was met. The hydrology in this area was consistent with that of the high marsh zone of a tidal salt marsh. Surface water was located within large pockets across the landscape that drained towards the estuarine stream located to the north.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP1

Tree Stratum (Plot size: 30 foot radius)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:		20% of total cover:	

Sapling/Shrub Stratum (Plot size: 30 foot radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Iva frutescens	25	YES	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	25 = Total Cover		
50% of total cover: 12.5		20% of total cover: 5	

Herb Stratum (Plot size: 30 foot radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Spartina patens	80	YES	FACW
2. Phragmites australis	10	NO	FACW
3. Spartina alterniflora	5	NO	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	95 = Total Cover		
50% of total cover: 47.5		20% of total cover: 19	

Woody Vine Stratum (Plot size: 30 foot radius)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✓ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ___

Remarks: (If observed, list morphological adaptations below).

The dominance test was met for this data point and therefore meets the hydrophytic vegetation parameter. This data point location was located within a salt marsh dominated by common saltmarsh species.

SOIL

Sampling Point: DP1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0 - 2	10YR 3/1	100					silt loam	muck presence
2 - 4	10YR 3/1	97	10YR 4/6	3			sandy loam	
4 - 24+	10YR 4/1	94	10YR 4/6	6			loamy fine sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☑ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☑ Muck Presence (A8) **(LRR U)**
- ☑ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ✓ No ____

Remarks:

The soil profile displayed 10YR 3/1 colored surface layers down to approximately 4 inches below the soil surface with a presence of muck observed within the upper 2 inches. The soil transitioned to 10YR 4/1 beyond 4 inches. Redoximorphic features (reduced iron) began at approximately 2 inches below the soil surface. A hydrogen sulfide odor was observed from the soil indicating the likely presence of persistent anaerobic conditions. The Hydrogen Sulfide (A4), Muck Presence (A8), 1cm Muck (A9), and Depleted Matrix (F3) hydric soil indicators were observed and the hydric soil parameter was met.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: UAS Airstrip Roadway City/County: Wallops Island, VA (Accomack County) Sampling Date: 01/13/2021

Applicant/Owner: GMB Architects & Engineers State: VA Sampling Point: DP2

Investigator(s): COVA Environmental (Rick Harris) Section, Township, Range: ______

Landform (hillslope, terrace, etc.): salt marsh Local relief (concave, convex, none): none - flat Slope (%): 0-1

Subregion (LRR or MLRA): LRR T Lat: 37.883916° N Long: -75.438630° W Datum: ______

Soil Map Unit Name: ChA—Chincoteague silt loam, 0 to 1 percent slopes, very frequently flooded NWI classification: E2EM1P

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ______	**Is the Sampled Area within a Wetland?**	**Yes** ✓ **No** ______
Hydric Soil Present?	Yes ✓ No ______		
Wetland Hydrology Present?	Yes ✓ No ______		

Remarks:

The hydrophytic vegetation, hydric soil, and wetland hydrology parameters were met. This area consisted of estuarine wetlands situated across a tidal salt marsh landscape. An estuarine stream was located adjacently to the north.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☑ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☑ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☑ Hydrogen Sulfide Odor (C1)
- ☑ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☑ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ✓ No ______	Depth (inches): 4"	
Water Table Present?	Yes ✓ No ______	Depth (inches): 0"	
Saturation Present? (includes capillary fringe)	Yes ✓ No ______	Depth (inches): 0"	**Wetland Hydrology Present? Yes** ✓ **No** ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

The Surface Water (A1), High Water Table (A2), Saturation (A3), Aquatic Fauna (B13), Hydrogen Sulfide Odor (C1), and Oxidized Rhizospheres along Living Roots (C3) primary wetland hydrology indicators were observed. The Drainage Patterns (B10), Geomorphic Position, (D2) and FAC-Neutral Test (D5) secondary wetland hydrology indicators were observed. The wetland hydrology parameter was met. The hydrology in this area was consistent with that of a tidal salt marsh. Surface water was located within large pockets across the landscape that drained towards the estuarine stream located adjacency to the north.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP2

Tree Stratum (Plot size: 30 foot radius)

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			
50% of total cover:	20% of total cover:		

Sapling/Shrub Stratum (Plot size: 30 foot radius)

	Absolute % Cover	Dominant Species?	Indicator Status
1. Iva frutescens	7	YES	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	7		
50% of total cover: 3.5	20% of total cover: 1.4		

Herb Stratum (Plot size: 30 foot radius)

	Absolute % Cover	Dominant Species?	Indicator Status
1. Spartina alterniflora	75	YES	OBL
2. Spartina patens	20	YES	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	95		
50% of total cover: 47.5	20% of total cover: 19		

Woody Vine Stratum (Plot size: 30 foot radius)

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
= Total Cover			
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
✓ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤ 3.0[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ___

Remarks: (If observed, list morphological adaptations below).

The dominance test was met for this data point and therefore meets the hydrophytic vegetation parameter. This data point location was located within a salt marsh dominated by common saltmarsh species.

SOIL

Sampling Point: DP2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0 - 2	10YR 3/1	100					loamy sand	muck presence
2 - 24+	10YR 4/1	95	10YR 5/6	5			sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☑ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☑ Muck Presence (A8) **(LRR U)**
- ☑ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☑ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☑ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ **No** ______

Remarks:

The soil profile displayed 10YR 3/1 colored surface layer down to approximately 2 inches below the soil surface with a presence of muck. The soil transitioned to 10YR 4/1 beyond 2 inches. Redoximorphic features (reduced iron) began at approximately 2 inches below the soil surface. A hydrogen sulfide odor was observed from the soil indicating the likely presence of persistent anaerobic conditions. The Hydrogen Sulfide (A4), Muck Presence (A8), 1cm Muck (A9), Sandy Mucky Mineral (S1), and Sandy Redox (S5) hydric soil indicators were observed and the hydric soil parameter was met.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: UAS Airstrip Roadway City/County: Wallops Island, VA (Accomack County) Sampling Date: 01/13/2021

Applicant/Owner: GMB Architects & Engineers State: VA Sampling Point: DP3

Investigator(s): COVA Environmental (Rick Harris) Section, Township, Range: ______

Landform (hillslope, terrace, etc.): ______ Local relief (concave, convex, none): convex Slope (%): 8-10

Subregion (LRR or MLRA): LRR T Lat: 37.884115° N Long: -75.438395° W Datum: ______

Soil Map Unit Name: CaA—Camocca fine sand, 0 to 2 percent slopes, frequently flooded NWI classification: UPLANDS

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____	**Is the Sampled Area within a Wetland?** **Yes** ____ **No** ✓
Hydric Soil Present?	Yes ____	No ✓	
Wetland Hydrology Present?	Yes ____	No ✓	

Remarks:

The hydrophytic vegetation parameter was met. However, the hydric soil and wetland hydrology parameters were not met. This area consisted of a sloped shoulder along a paved roadway that qualified as uplands. The roadway and shoulder was a few feet higher than the adjacent wetlands and appeared to be effectively drained due to its convex relief.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ____	No ✓	Depth (inches): N/A
Water Table Present?	Yes ✓	No ____	Depth (inches): 20"
Saturation Present? (includes capillary fringe)	Yes ✓	No ____	Depth (inches): 19"

Wetland Hydrology Present? Yes ____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

The FAC-Neutral Test (D5) secondary wetland hydrology indicator was the only indicator observed due to the Spartina patens that encroached within this area from the wetlands. The wetland hydrology parameter was not met. The landscape in this area consisted of a sloped shoulder along a paved roadway. The roadway and shoulder was a few feet higher than the adjacent wetlands and appeared to be effectively drained due to its convex relief.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP3

Tree Stratum (Plot size: 30 foot radius)

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

50% of total cover: ______ 20% of total cover: ______

Sapling/Shrub Stratum (Plot size: 30 foot radius)

	Absolute % Cover	Dominant Species?	Indicator Status
1. Baccharis halimifolia	25	YES	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	25		

50% of total cover: 12.5 20% of total cover: 5

Herb Stratum (Plot size: 30 foot radius)

	Absolute % Cover	Dominant Species?	Indicator Status
1. Spartina patens	40	YES	FACW
2. Schedonorus arundinaceus	25	YES	FAC
3. Panicum virgatum	5	NO	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	70		

50% of total cover: 35 20% of total cover: 14

Woody Vine Stratum (Plot size: 30 foot radius)

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
= Total Cover			

50% of total cover: ______ 20% of total cover: ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
✓ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤ 3.0
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ______

Remarks: (If observed, list morphological adaptations below).

The dominance test was met for this data point and therefore meets the hydrophytic vegetation parameter. This data point location was located along the sloped shoulder of a paved roadway. The vegetation near the roadway appeared to be routinely mowed and therefore the vegetation in the mowed areas was difficult to analyze.

SOIL

Sampling Point: DP3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 8	2.5Y 6/4	100					sand	
8 - 14	2.5Y 6/3	100					sand	
14 - 22	2.5Y 6/3	98	2.5Y 5/6	2			sand	
22 - 26+	10YR 3/1	100					fine sandy loam	buried former surface layer

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No ✓

Remarks:

The soil profile displayed a 2.5Y 6/4 colored surface layer down to approximately 8 inches below the soil surface, underlain by 2.5Y 6/3 colored layers from 8 to 22 inches below the soil surface. Redoximorphic features (reduced iron) began at approximately 14 inches below the soil surface. A 10YR 3/1 colored layer was observed beyond 22 inches below the soil surface. This darker colored layer appeared to be the former soil surface due to its similar characteristics to the soil profiles observed in the nearby wetlands that are outside of the roadway area. This former surface layer has most likely been buried by fill materials that were deposited for the shoulder of the paved roadway. No hydric soil indicators were observed and the hydric soil parameter was not met.

DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS
NORFOLK DISTRICT
FORT NORFOLK
803 FRONT STREET
NORFOLK VA 23510-1011

March 23, 2021

PRELIMINARY JURISDICTIONAL DETERMINATION

Eastern Virginia Regulatory Section
NAO-2020-1758 (Chincoteague Inlet)

NASA Wallops Flight Facility
Attn: Paul Bull
34200 Fulton Street
Wallops Island, VA 23338

Dear Mr. Bull:

This letter is in regard to your request for a preliminary jurisdictional determination for waters of the U.S. (including wetlands) associated with the project known as NASA WFF Wallops Pier adjacent to the Mid-Atlantic Regional Spaceport's (MARS) unmanned airstrip at Wallops Flight Facility in Wallops Island, Virginia.

The map entitled "Figure 3, Wetland Delineation Map", by AECOM dated 09/10/2020 (*copy enclosed)* provides the location(s) of waters and/or wetlands on the property listed above. The basis for this delineation includes application of the Corps' 1987 Wetland Delineation Manual, the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region*, positive indicators of wetland hydrology, hydric soils, and hydrophytic vegetation. This letter is not confirming the Cowardin classifications of these aquatic resources.

The Norfolk District has relied on the information and data provided by the applicant or agent. If such information and data subsequently prove to be materially false or materially incomplete, this verification may be suspended or revoked, in whole or in part, and/or the Government may institute appropriate legal proceedings.

Discharges of dredged or fill material, including those associated with mechanized landclearing, into waters and/or wetlands on this site may require a Department of the Army permit and authorization by state and local authorities including a Virginia Water Protection Permit from the Virginia Department of Environmental Quality (DEQ), a permit from the Virginia Marine Resources Commission (VMRC) and/or a permit from your local wetlands board. This letter is a confirmation of the Corps preliminary jurisdiction for the waters and/or wetlands on the subject property and does not authorize any work in these areas. Please obtain all required permits before starting work in the delineated waters/wetland areas.

This is a preliminary jurisdictional determination and is therefore not a legally binding determination regarding whether Corps jurisdiction applies to the waters or wetlands in question. Accordingly, you may either consent to jurisdiction as set out in this preliminary jurisdictional determination and the attachments hereto if you agree with the determination, or you may request and obtain an approved jurisdictional determination. This preliminary jurisdictional determination and associated wetland delineation map may be submitted with a permit application.

Enclosed is a copy of the “Preliminary Jurisdictional Determination Form”. Please review the document, sign, and return one copy to me either via email (brian.c.denson@usace.army.mil) or via standard mail to US Army Corps of Engineers, Regulatory Office, and ATTN: Mr. Brian Denson, 803 Front Street Norfolk, Virginia 23510 within 30 days of receipt and keep one for your records. This delineation of waters and/or wetlands can be relied upon for no more than five years from the date of this letter. New information may warrant revision.

If you have any questions, please contact me either via telephone at (757) 201-7792 or via email at the address above. Please include your NAO project number within the subject line.

Sincerely,

Brian Denson
Project Manager Eastern Virginia
Regulatory Section

Enclosure(s): Referenced Delineation Map, Preliminary JD Form

National Aeronautics and Space Agency
Wallops Flight Facility
2020

Wallops Pier
Accomack County, VA

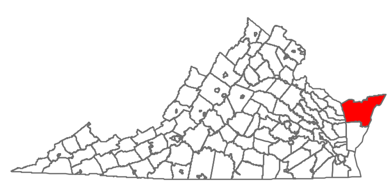
Last Date Edited: 9/10/2020
Project Number: 60631607

0 300 600 Feet

Legend

- Study Area
- Wetlands
- Surface Water
- Determination Points

Figure 3
Wetland Delineation Map



Accomack County

Appendix 2 - PRELIMINARY JURISDICTIONAL DETERMINATION (PJD) FORM

BACKGROUND INFORMATION

A. **REPORT COMPLETION DATE FOR PJD:** 23-MAR-2021

B. **NAME AND ADDRESS OF PERSON REQUESTING PJD:**

C. **DISTRICT OFFICE, FILE NAME, AND NUMBER:**
NAO, NASA WALLOPS PORT FACILITY, NAO-2020-01758-BCD

D. PROJECT LOCATION(S) AND BACKGROUND INFORMATION:
(USE THE TABLE BELOW TO DOCUMENT MULTIPLE AQUATIC RESOURCES AND/OR AQUATIC RESOURCES AT DIFFERENT SITES)

State: VA County/parish/borough: Accomack County City:
Center coordinates of site (lat/long in degree decimal format):
Lat.: 37.887023° Long.: -75.439844°
Universal Transverse Mercator: 18
Name of nearest waterbody: Chincoteague Bay

E. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
☒ Office (Desk) Determination. Date: March 23, 2021
☐ Field Determination. Date(s):

TABLE OF AQUATIC RESOURCES IN REVIEW AREA WHICH "MAY BE" SUBJECT TO REGULATORY JURISDICTION.

Site Number	Latitude (decimal degrees)	Longitude (decimal degrees)	Estimated amount of aquatic resource in review area (acreage and linear feet, if applicable)	Type of aquatic resource (i.e., wetland vs. non-wetland waters)	Geographic authority to which the aquatic resource "may be" subject (i.e., Section 404 or Section 10/404)
Surface Water	37.889561	-75.441146	3 acres	Non-wetland waters	Section 10/404
WA	37.885179	-75.437651	1.53 acres	Wetland	Section 10/404
WB	37.886539	-75.439739	3.56 acres	Wetland	Section 10/404

1) The Corps of Engineers believes that there may be jurisdictional aquatic resources in the review area, and the requestor of this PJD is hereby advised of his or her option to request and obtain an approved JD (AJD) for that review area based on an informed decision after having discussed the various types of JDs and their characteristics and circumstances when they may be appropriate.
2) In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre-construction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an AJD for the activity, the permit applicant is hereby made aware that: (1) the permit applicant has elected to seek a permit authorization based on a PJD, which does not make an official determination of jurisdictional aquatic resources; (2) the applicant has the option to request an AJD before accepting the terms and conditions of the permit

[1] Districts may establish timeframes for requester to return signed PJD forms. If the requester does not respond within the established time frame, the district may presume concurrence and no additional follow up is necessary prior to finalizing an action.

authorization, and that basing a permit authorization on an AJD could possibly result in less compensatory mitigation being required or different special conditions; (3) the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) undertaking any activity in reliance upon the subject permit authorization without requesting an AJD constitutes the applicant's acceptance of the use of the PJD; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a PJD constitutes agreement that all aquatic resources in the review area affected in any way by that activity will be treated as jurisdictional, and waives any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an AJD or a PJD, the.JD will be processed as soon as practicable. Further, an AJD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331. If, during an administrative appeal, it becomes appropriate to make an official determination whether geographic jurisdiction exists over aquatic resources in the review area, or to provide an official delineation of jurisdictional aquatic resources in the review area, the Corps will provide an AJD to accomplish that result, as soon as is practicable. This PJD finds that there “may be” waters of the U.S. and/or that there “may be” navigable waters of the U.S. on the subject review area, and identifies all aquatic features in the review area that could be affected by the proposed activity, based on the following information:

SUPPORTING DATA. Data reviewed for PJD (check all that apply)

Checked items should be included in subject file. Appropriately reference sources below where indicated for all checked items:

_X__ Maps, plans, plots or plat submitted by or on behalf of the PJD requestor:
Map: Figure 3 Wetland Delineation Map___.
__X_ Data sheets prepared/submitted by or on behalf of the PJD requestor.
__X_ Office concurs with data sheets/delineation report.
___ Office does not concur with data sheets/delineation report. Rationale: ____________________.
___ Data sheets prepared by the Corps: ____________________________.
___ Corps navigable waters' study: ____________________________.
_X__ U.S. Geological Survey Hydrologic Atlas: ____________________________.
___ USGS NHD data.
_X__ USGS 8 and 12 digit HUC maps.
_X__ U.S. Geological Survey map(s). Cite scale & quad name: _____Chincoteague West____.
__X_ Natural Resources Conservation Service Soil Survey. Citation: __________________________.
_X__ National wetlands inventory map(s). Cite name: ____________________________.
___ State/local wetland inventory map(s): ____________________________.
___ FEMA/FIRM maps: ____________________________
___ 100-year Floodplain Elevation is: _______________. (National Geodetic Vertical Datum of 1929)
_X__ Photographs: __X_ Aerial (Name & Date): ____Google Earth Various years___.
___ or __X_ Other (Name & Date): __photos provided by agent___.
___ Previous determination(s). File no. and date of response letter: __________________________.

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___ Other information (please specify): ___________________________.

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

Paul Bull

Signature and date of Regulatory staff member completing PJD

Signature and date of person requesting PJD (REQUIRED, unless obtaining the signature is impracticable)[1]

[1] Districts may establish timeframes for requester to return signed PJD forms. If the requester does not respond within the established time frame, the district may presume concurrence and no additional follow up is necessary prior to finalizing an action.

DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS
NORFOLK DISTRICT
FORT NORFOLK
803 FRONT STREET
NORFOLK VA 23510-1011

March 16, 2021

PRELIMINARY JURISDICTIONAL DETERMINATION

Eastern Virginia Regulatory Section
NAO-2020-1758 (Cow Gut Flat)

NASA Wallops Flight Facility
Attn: Paul Bull
34200 Fulton Street
Wallops Island, VA 23338

Dear Mr. Bull:

This letter is in regard to your request for a preliminary jurisdictional determination for waters of the U.S. (including wetlands) for the road crossing portion of the NASA Wallops Pier project, located on a 0.645 acre study area near the UAS Airstrip in Wallops Island, Virginia (tax map parcel #02800A000007500).

The map entitled "Exhibit 2: Site Map, UAS Airstrip Wetland Delineation, Wallops Island, VA", by Rick Harris dated 01/14/2021 (*copy enclosed)* provides the location(s) of waters and/or wetlands on the property listed above. The basis for this delineation includes application of the Corps' 1987 Wetland Delineation Manual, the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region*, positive indicators of wetland hydrology, hydric soils, and hydrophytic vegetation and the presence of a mean high water mark. This letter is not confirming the Cowardin classifications of these aquatic resources.

The Norfolk District has relied on the information and data provided by the applicant or agent. If such information and data subsequently prove to be materially false or materially incomplete, this verification may be suspended or revoked, in whole or in part, and/or the Government may institute appropriate legal proceedings.

Discharges of dredged or fill material, including those associated with mechanized landclearing, into waters and/or wetlands on this site may require a Department of the Army permit and authorization by state and local authorities including a Virginia Water Protection Permit from the Virginia Department of Environmental Quality (DEQ), a permit from the Virginia Marine Resources Commission (VMRC) and/or a permit from your local wetlands board. This letter is a confirmation of the Corps preliminary jurisdiction for the waters and/or wetlands on the subject property and does not authorize any work in these areas. Please obtain all required permits before starting work in the delineated waters/wetland areas.

This is a preliminary jurisdictional determination and is therefore not a legally binding determination regarding whether Corps jurisdiction applies to the waters or wetlands in question. Accordingly, you may either consent to jurisdiction as set out in this preliminary jurisdictional determination and the attachments hereto if you agree with the determination, or you may request and obtain an approved jurisdictional determination. This preliminary jurisdictional determination and associated wetland delineation map may be submitted with a permit application.

Enclosed is a copy of the "Preliminary Jurisdictional Determination Form". Please review the document, sign, and return one copy to me either via email (brian.c.denson@usace.army.mil) or via standard mail to US Army Corps of Engineers, Regulatory Office, and ATTN: Mr. Brian Denson, 803 Front Street Norfolk, Virginia 23510 within 30 days of receipt and keep one for your records. This delineation of waters and/or wetlands can be relied upon for no more than five years from the date of this letter. New information may warrant revision.

If you have any questions, please contact me either via telephone at (757) 201-7792 or via email at the address above. Please include your NAO project number within the subject line.

Sincerely,

Brian Denson
Project Manager Eastern Virginia
Regulatory Section

Enclosure(s): Referenced Delineation Map, Preliminary JD Form

Exhibit 2: Site Map, UAS Airstrip Wetland Delineation, Wallops Island, VA

Source: VGIN 2017 Aerial Basemap; Delineation Data Collected via Trimble R1 GNSS Receiver

Legend

Study Area ~ 0.645 acres

E2EM1P Wetlands ~ 0.519 cumulative acres

E1UBL Stream ~ 151 cumulative linear feet

Culvert Pipe ~ 29 linear feet

Data Point

COVA Project #: 2020-032
Date: 01/14/2021
Created By: Rick Harris
VA PWD #: 3402000173

COASTAL VIRGINIA
ENVIRONMENTAL SERVICES

Appendix 2 - PRELIMINARY JURISDICTIONAL DETERMINATION (PJD) FORM

BACKGROUND INFORMATION

A. **REPORT COMPLETION DATE FOR PJD:** 16-MAR-2021

B. **NAME AND ADDRESS OF PERSON REQUESTING PJD:**
NASA Wallops Flight Facility
Attn: Paul Bull
34200 Fulton Street
Wallops Island, VA 23338

C. **DISTRICT OFFICE, FILE NAME, AND NUMBER:**
NAO, NASA WALLOPS PORT FACILITY, NAO-2020-01758-BCD

D. PROJECT LOCATION(S) AND BACKGROUND INFORMATION:
(USE THE TABLE BELOW TO DOCUMENT MULTIPLE AQUATIC RESOURCES AND/OR AQUATIC RESOURCES AT DIFFERENT SITES)

State: VA County/parish/borough: Accomack County City:
Center coordinates of site (lat/long in degree decimal format):
Lat.: 37.888799º Long.: -75.442899º
Universal Transverse Mercator: 18
Name of nearest waterbody: Chincoteague Bay

E. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
☒ Office (Desk) Determination. Date: March 16, 2021
☐ Field Determination. Date(s):

TABLE OF AQUATIC RESOURCES IN REVIEW AREA WHICH "MAY BE" SUBJECT TO REGULATORY JURISDICTION.

Site Number	Latitude (decimal degrees)	Longitude (decimal degrees)	Estimated amount of aquatic resource in review area (acreage and linear feet, if applicable)	Type of aquatic resource (i.e., wetland vs. non-wetland waters)	Geographic authority to which the aquatic resource "may be" subject (i.e., Section 404 or Section 10/404)
E1UBL	37.883995	-75.438419	151 feet	Non-wetland waters	Section 10/404
E2EM1P	37.883962	-75.438454	0.519 acres	Wetland	Section 10/404

1) The Corps of Engineers believes that there may be jurisdictional aquatic resources in the review area, and the requestor of this PJD is hereby advised of his or her option to request and obtain an approved JD (AJD) for that review area based on an informed decision after having discussed the various types of JDs and their characteristics and circumstances when they may be appropriate.
2) In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre-construction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an AJD for the activity, the permit applicant is hereby made aware

[1] Districts may establish timeframes for requester to return signed PJD forms. If the requester does not respond within the established time frame, the district may presume concurrence and no additional follow up is necessary prior to finalizing an action.

that: (1) the permit applicant has elected to seek a permit authorization based on a PJD, which does not make an official determination of jurisdictional aquatic resources; (2) the applicant has the option to request an AJD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an AJD could possibly result in less compensatory mitigation being required or different special conditions; (3) the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) undertaking any activity in reliance upon the subject permit authorization without requesting an AJD constitutes the applicant's acceptance of the use of the PJD; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a PJD constitutes agreement that all aquatic resources in the review area affected in any way by that activity will be treated as jurisdictional, and waives any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an AJD or a PJD, the.JD will be processed as soon as practicable. Further, an AJD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331. If, during an administrative appeal, it becomes appropriate to make an official determination whether geographic jurisdiction exists over aquatic resources in the review area, or to provide an official delineation of jurisdictional aquatic resources in the review area, the Corps will provide an AJD to accomplish that result, as soon as is practicable. This PJD finds that there “may be” waters of the U.S. and/or that there “may be” navigable waters of the U.S. on the subject review area, and identifies all aquatic features in the review area that could be affected by the proposed activity, based on the following information:

SUPPORTING DATA. Data reviewed for PJD (check all that apply)

Checked items should be included in subject file. Appropriately reference sources below where indicated for all checked items:

_X__ Maps, plans, plots or plat submitted by or on behalf of the PJD requestor:
Map: _ Exhibit 2: Site Map, UAS Airstrip Wetland Delineation, Wallops Island, VA.
_X__ Data sheets prepared/submitted by or on behalf of the PJD requestor.
_X__ Office concurs with data sheets/delineation report.
___ Office does not concur with data sheets/delineation report. Rationale: ____________________.
___ Data sheets prepared by the Corps: ____________________________.
___ Corps navigable waters' study: ____________________________.
_X__ U.S. Geological Survey Hydrologic Atlas: ____________________________.
X USGS NHD data.
_X__ USGS 8 and 12 digit HUC maps.
_X__ U.S. Geological Survey map(s). Cite scale & quad name: ____________________________.
_X__ Natural Resources Conservation Service Soil Survey. Citation: __________________________.
_X__ National wetlands inventory map(s). Cite name: ____________________________.
___ State/local wetland inventory map(s): ____________________________.
___ FEMA/FIRM maps: ____________________________
___ 100-year Floodplain Elevation is: _______________. (National Geodetic Vertical Datum of 1929)

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_X__ Photographs: _X__ Aerial (Name & Date): __Google Earth various years____.
___ or ___ Other (Name & Date): ____________________________.
___ Previous determination(s). File no. and date of response letter: ___________________________.
___ Other information (please specify): ____________________________.

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

Paul Bull

____
Signature and date of Regulatory staff member completing PJD

____
Signature and date of person requesting PJD (REQUIRED, unless obtaining the signature is impracticable)[1]

[1] Districts may establish timeframes for requester to return signed PJD forms. If the requester does not respond within the established time frame, the district may presume concurrence and no additional follow up is necessary prior to finalizing an action.

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APPENDIX C –

FEDERAL CONSISTENCY DETERMINATION

Kisak, Natalie

From: Martin, Amy (DWR) <Amy.Martin@dwr.virginia.gov>
Sent: Thursday, March 23, 2023 1:45 PM
To: Miller, Shari (WFF-2500); Boettcher, Ruth (DWR)
Cc: Brittingham, Alan L. (WFF-013.0)[Virginia Commercial Space Flight Authority]
Subject: [EXTERNAL] RE: NASA Wallops Flight Facility Island Northern Development, DEQ 21-164F

Shari,
Sorry for the delay in responding. We are generally supportive of the EA updates. Assuming the conservation measures to avoid impacts upon wildlife included in those updates are implemented fully, we agree that this project is consistent. Any deviations from the conservation measures may take NASA our of compliance with the CZM enforceable policies for which we are responsible.

Will we get a copy of the updated EA for review – either from you or DEQ's Office of Environmental Impact Review?

Thanks, Amy

Amy Martin
(she/her/hers)
Manager, Wildlife Information and Environmental Services
P 804.481.5296
Virginia Department of Wildlife Resources
CONSERVE. CONNECT. PROTECT.
A 7870 Villa Park Drive, P.O. Box 90778, Henrico, VA 23228-0778
www.dwr.virginia.gov

From: Miller, Shari (WFF-2500) <shari.a.miller@nasa.gov>
Sent: Friday, March 17, 2023 9:36 AM
To: Martin, Amy (DWR) <Amy.Martin@dwr.virginia.gov>; Boettcher, Ruth (DWR) <Ruth.Boettcher@dwr.virginia.gov>
Cc: Brittingham, Alan L. (WFF-013.0)[Virginia Commercial Space Flight Authority] <alan.brittingham@vaspace.org>
Subject: FW: NASA Wallops Flight Facility Island Northern Development, DEQ 21-164F

Good morning, Amy and Ruth.

I'm checking to see if you need any additional information or have any questions on the attached.

Thanks so much.

Shari A. Miller
Center NEPA Manager and
Environmental Planning Lead
NASA GSFC Wallops Flight Facility
Wallops Island, VA 23337

(757) 824-2327
Shari.A.Miller@nasa.gov
Environmental Planning & Impact Assessment (nasa.gov)

"A single act of kindness throws out roots in all directions and the roots spring up and make new trees." – Amelia Earhart

---

From: Miller, Shari (WFF-2500)
Sent: Thursday, March 2, 2023 3:04 PM
To: amy.martin@dwr.virginia.gov; Ruth Boettcher <ruth.boettcher@dwr.virginia.gov>
Cc: Finch, Kimberly (GSFC-2500) <kimberly.s.finch@nasa.gov>; Meyer, T J (WFF-2500) <theodore.j.meyer@nasa.gov>; Finio, Alan (MARAD) <alan.finio@dot.gov>; Bahnson, Sara E CIV USARMY CENAO (USA) <sara.e.bahnson@usace.army.mil>; Brittingham, Alan L. (WFF-013.0)[Virginia Commercial Space Flight Authority] <alan.brittingham@vaspace.org>
Subject: NASA Wallops Flight Facility Island Northern Development, DEQ 21-164F

Dear Ms. Martin,

Based your agency's comments in a letter dated February 7, 2022, which was incorporated into the Federal Consistency Conditional Concurrence provided by the Virginia Department of Environmental Quality (DEQ) on February 28, 2022, regarding the draft Wallops Island Northern Development Environmental Assessment (WIND EA), NASA Wallops Flight Facility and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) are resubmitting the attached consultation. NASA and VA Space propose to construct of a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel. NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for Virginia's Coastal Zone Management (CZM) Federal Consistency Determination. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfil their requirements.

NASA believes that, given consideration of VDWR's comments and updates to the EA reflecting these recommendations, the proposed project should now be considered consistent to the maximum extent practicable with the enforceable policies of Virginia's CZM Program.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Shari A. Miller
Center NEPA Manager and
Environmental Planning Lead
NASA GSFC Wallops Flight Facility
Wallops Island, VA 23337
(757) 824-2327
Shari.A.Miller@nasa.gov
Environmental Planning & Impact Assessment (nasa.gov)

"A single act of kindness throws out roots in all directions and the roots spring up and make new trees." – Amelia Earhart

COMMONWEALTH of VIRGINIA

Marine Resources Commission
380 Fenwick Road
Bldg 96
Fort Monroe, VA 23651-1064

Travis A. Voyles
Secretary of Natural and Historic Resources

Jamie L. Green
Commissioner

March 20, 2023

National Aeronautics and Space Administration
Attn: Shari A. Miller
Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337

Re: NASA Wallops Island Northern Development Project, Federal Consistency Determination (DEQ 21-164F)

Dear Ms. Miller,

This will respond to your March 2, 2023, request for our revised comments regarding the Environmental Assessment (EA) and Federal Consistency Determination for the NASA Wallops Island Northern Development Project (DEQ 21-164F), prepared by the National Aeronautics and Space Administration (NASA). Specifically, NASA has proposed to impact tidal wetlands and subaqueous bottom habitat for the construction of a fixed pier and turning basin, a hangar at the Unmanned Aerial Systems (UAS) Airstrip, installation of new utility infrastructure, installation of airstrip lighting, hardening/reinforcement of a section of the airstrip, improvements to the airstrip access road, construction of a new pier access road adjacent to the UAS Airstrip, construction of a new 20 to 30 vehicle parking lot, construction of a project support building, and channel dredging (vessel approach channel). The project is located in Accomack County, Virginia.

We reviewed the revised project documents received on March 2, 2023, that propose jurisdictional impacts to State-owned submerged lands and tidal wetlands within the purview of the Virginia Marine Resources Commission (VMRC) and the local Accomack County Wetlands Board.

Please be advised that the VMRC pursuant to Chapters 12, 13, and 14 of Title 28.2 of the Code of Virginia administers permits required for submerged lands, tidal wetlands, and beaches and dunes. Additionally, the VMRC administers the enforceable policies of fisheries management, subaqueous lands, tidal wetlands, and coastal primary sand dunes and beaches, which comprise key components of Virginia's Coastal Zone Management Program. VMRC staff has reviewed the submittal and offers the following comments:

Fisheries and Shellfish: Private shellfish leases and public clam grounds are situated directly adjacent to the proposed channel. To mitigate for turbidity impacts, NASA and the Virginia Commercial Space Flight Authority will use turbidity curtains when dredging operations approach leased shellfish lands. If the use of turbidity curtains is not possible due to current velocities, dredging would be conducted during slack tides or currents carry suspended sediment away from shellfish resources.

Submerged Lands: The project as proposed will require the dredging of 94,000 cubic yards of State-owned bottom material. This will require a permit from VMRC. The applicant now proposes utilizing the sandy dredged material for onshore sand renourishment on Wallops Island in lieu of the previous request to dispose of this valuable State resource in the Atlantic Ocean.

Tidal Wetlands: A wetlands board permit with compensatory mitigation will be required from the Accomack County Wetlands Board for all proposed impacts to tidal wetlands.

Beaches and Coastal Primary Sand Dunes: No adverse impacts to jurisdictional beaches and dunes are anticipated. The sandy dredged material will be used for onshore sand renourishment on Wallops Island.

While we have no objection to the consistency findings provided by the applicant, our final consistency recommendation cannot be reached until completion of the permit review process by both the Accomack County Wetlands Board and VMRC. Any permit issued by the Board or VMRC will specify necessary special conditions for the project.

Please contact me at (757) 247-2251 or by email at randy.owen@mrc.virginia.gov if you have any questions. Thank you for the opportunity to comment.

Sincerely,

Randy Owen
Chief, Habitat Management Division

RO/cg
HM

Kisak, Natalie

From: Miller, Shari (WFF-2500) <shari.a.miller@nasa.gov>
Sent: Thursday, March 2, 2023 3:04 PM
To: amy.martin@dwr.virginia.gov; Ruth Boettcher
Cc: Finch, Kimberly (GSFC-2500); Meyer, T J (WFF-2500); Finio, Alan (MARAD); Bahnson, Sara E CIV USARMY CENAO (USA); Brittingham, Alan L. (WFF-013.0)[Virginia Commercial Space Flight Authority]
Subject: NASA Wallops Flight Facility Island Northern Development, DEQ 21-164F
Attachments: NASA WFF ND - VDWR Consistency Ltr_updated_20230328.pdf

Dear Ms. Martin,

Based your agency's comments in a letter dated February 7, 2022, which was incorporated into the Federal Consistency Conditional Concurrence provided by the Virginia Department of Environmental Quality (DEQ) on February 28, 2022, regarding the draft Wallops Island Northern Development Environmental Assessment (WIND EA), NASA Wallops Flight Facility and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) are resubmitting the attached consultation. NASA and VA Space propose to construct of a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel. NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for Virginia's Coastal Zone Management (CZM) Federal Consistency Determination. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfil their requirements.

NASA believes that, given consideration of VDWR's comments and updates to the EA reflecting these recommendations, the proposed project should now be considered consistent to the maximum extent practicable with the enforceable policies of Virginia's CZM Program.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Shari A. Miller
Center NEPA Manager and
Environmental Planning Lead
NASA GSFC Wallops Flight Facility
Wallops Island, VA 23337
(757) 824-2327
Shari.A.Miller@nasa.gov
Environmental Planning & Impact Assessment (nasa.gov)

"A single act of kindness throws out roots in all directions and the roots spring up and make new trees." – Amelia Earhart

National Aeronautics and Space Administration

Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337

Reply to Attn of: 250.W

March 2, 2023

Ms. Amy Martin
Manager, Wildlife Information and Environmental Services
Virginia Department of Wildlife Resources
7870 Villa Park Drive
P.O. Box 90778
Henrico, VA 23228

Re: NASA Wallops Island Northern Development Project, Federal Consistency Determination (DEQ 21-164F)

Dear Ms. Martin:

This letter is in response to your correspondence dated February 7, 2022, which was incorporated into the Federal Consistency Conditional Concurrence provided by the Virginia Department of Environmental Quality (DEQ) on February 28, 2022. The National Aeronautics and Space Administration (NASA) is providing a written response to the comments and recommendations contained within that letter.

As described in the Environmental Assessment (EA) and Federal Consistency Determination prepared for the NASA Wallops Island Northern Development Project, NASA Wallops Flight Facility (WFF) and the Virginia Commercial Space Flight Authority (VCSFA) propose to construct a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel. NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Federal Consistency consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfill their requirements.

The proposal by NASA generally includes the following actions: channel dredging; construction of a new pier; construction of a second hangar at the UAS Airstrip; installation of new utility infrastructure; installation of new airstrip lighting and hardening of a section of runway; improvements to the UAS Airstrip access road; construction of a new pier access road; construction of a new project support building; and construction of a new vehicle parking lot. These actions would be completed in phases. Phase 1 would include construction of all onshore components and infrastructure. Phase 2 would include extension of the fixed pier and dredging of a turning basin at the end of the pier. Phase 3 would include additional dredging of the turning basin as well as a vessel approach channel from Chincoteague Inlet Channel. All dredged material would be placed at the North Wallops Island beach borrow area to support ongoing shoreline enhancement and restoration.

NASA has prepared an EA in accordance with NEPA to analyze the potential effects of the proposed action on the environment. The EA has been tiered from the May 2019 *NASA WFF Site-Wide Programmatic Environmental Impact Statement* (Site-wide PEIS), in which NASA evaluated the environmental consequences of constructing and operating new facilities and infrastructure at WFF. As part of the EA process, NASA also prepared a Federal Consistency Determination in accordance with the Coastal Zone Management Act (CZMA) of 1972 (15 Code of Federal Regulations Part 930, Subpart C) to evaluate the reasonably foreseeable effects of the proposed project on Virginia's coastal uses or resources. The Consistency Determination was submitted to DEQ by NASA on December 16, 2021, and concluded that the proposed project would be consistent to the maximum extent practicable with the enforceable policies of Virginia's Coastal Zone Management (CZM) Program; however, in a response dated February 28, 2022, DEQ conditionally concurred with NASA's determination. DEQ received comments from various agencies within Virginia's CZM Program and provided a conditional concurrence based on NASA addressing the recommendations and obtaining necessary authorizations. Since the issuance of the conditional concurrence, NASA has revised the EA to include such considerations.

In addition, NASA has previously consulted with the U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration (NOAA) Fisheries Service under Section 7 of the Endangered Species Act (ESA) regarding potential impacts to listed species. NASA has also continued consultation with NOAA Fisheries under the Magnuson Stevens Fishery Conservation and Management Act regarding potential impacts to Essential Fish Habitat (EFH). The recommendations provided by USFWS and NOAA Fisheries have also been incorporated into the EA.

The following section describes how NASA has incorporated the Virginia Department of Wildlife Resources' (VDWR) comments and recommendations into the EA. The original comments provided by VDWR, and NASA's responses, are included in **Attachment 1**.

VDWR Comments on the Consistency Determination

As described above, VDWR provided comments on NASA's Consistency Determination that was submitted to the DEQ in accordance with the Virginia CZM Program. As a result of VDWR's and others' comments on the Consistency Determination, DEQ issued a conditional concurrence dependent on NASA's acceptance of the recommendations and obtainment of the necessary authorizations.

VDWR submitted multiple comments regarding potential impacts to special status species during construction. NASA has revised the EA to eliminate mention of hydraulic dredging, as this type of dredging is not feasible in the waters within the action area, and would therefore not occur under the proposed project. Information provided by VDWR and USFWS regarding the potential presence of sea turtles until January has been incorporated. Additionally, the placement of beach-quality, sandy dredged material from Phase 1 of the Proposed Action at the North Wallops Island beach borrow area would be restricted from March 15 to August 31 to minimize impacts to shorebirds, and the restriction would be extended to November 30 if a sea turtle nest were discovered. To the greatest extent possible, NASA and VCSFA would endeavor to coordinate dredging operations and material placement from Phase 2 and Phase 3 with ongoing WFF shoreline renourishment actions, but may be limited due to the availability of funding. These potential impacts from dredge material placement were evaluated in a Biological Opinion issued by the USFWS in 2019, and NASA would comply with all terms and conditions of the Biological Opinion. To minimize the potential for take of sea turtles during dredge operations and other construction activities, an onboard observer would be present to identify any listed species in the vicinity. Such observers would not be present during normal vessel operation occurring in the area.

Moreover, no construction activities would occur within 600 feet or a peregrine falcon nest, as the nearest artificial nesting platform is located over 3,150 feet from the action area. Additionally, since the submittal of the Consistency Determination, USFWS has proposed listing the tricolored bat (*Perimyotis subflavus*) as an endangered species under ESA and the status of the northern long-eared bat (*Myotis septentrionalis*) has been elevated from threatened to endangered. NASA and VCSFA are consulting with USFWS on ways to minimize potential impacts to these bat species from tree clearing associated with the project (approximately 1 acre) and have currently proposed a time of year restriction of April 1 to November 14.

VDWR also submitted comments regarding special status species during operation, specifically related to vessel traffic. NASA updated the EA to include the anticipated annual number of vessel trips to the MARS Port, as well as the size of the vessels transiting the action area. NASA has estimated the total number of vessel trips to be 99 trips per year. For comparison, the nearby Chincoteague Inlet port supports over 3,000 vessels per year. Potential impacts from the operational vessel trips have been assessed, and determined to be insignificant.

Finally, due to the comments submitted and uncertainty regarding the implementation of Best Management Practices (BMPs) to minimize species impacts, VDWR determined that the proposed project was not consistent with the enforceable policies over which VDWR has jurisdiction. Since receiving these comments, NASA has continued to consult with USFWS and NOAA Fisheries, and has included those agencies' and VDWR's recommendations in the EA. NASA believes that, given new updates to the EA incorporating impact minimization measures, the proposed project should now be considered consistent to the maximum extent practicable with the enforceable policies of Virginia's CZM Program.

Best Management Practices Summary

In addition to implementing minimization and mitigation measures discussed above, NASA and VCSFA have developed a list of BMPs to further reduce the potential for adverse impacts. This list of BMPs was developed based on routine construction best practices as well as on the results of consultation and recommendations provided by other agencies. The complete list of BMPs is included within the EA and is copied below (**Table 1**).

Table 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). • 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 unexploded ordnance (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	• Stormwater Pollution Prevention Plan (SWPPP), erosion and sediment control (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 Integrated Contingency Plan (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 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 centimeters (12 inches) 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 and fueling and maintenance of vehicles and equipment. • Wetland ground and vegetation disturbance would be returned to pre-construction conditions, in accordance with permit requirements. • Compensate for permanent wetland impacts in accordance with the USACE/USEPA 2008 Compensatory Mitigation Rule. • 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. • Monitoring of wetlands, streambeds, channels, etc. in construction areas would occur in accordance with all project permits. • 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.
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. • Mitigation of invasive species (e.g., *Phragmites*) would occur in accordance with the *WFF Phragmites Control Plan*.

Table 1. Summary of BMPs, Mitigation and Monitoring Measures

Resource Area	Measures
Wildlife and Special Status Species	• 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, comply with time-of-year tree clearing restrictions from April 1 to November 14, and restrictions on dredge material beach placement from March 15 to August 31, or to November 30 if a sea turtle nest is discovered. • 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. • 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. • Restrictions may be placed on the number of trips taken by each vessel and shallow-draft vessels may be used for water-related projects. • Adherence of and monitoring consistent with the ICP, SWPPP, and other applicable permits and plans. • Sediment curtains could be utilized during dredging and pier construction, if necessary. • Bubble curtains could be utilized for noise attenuation during pile driving. • Special-status species (e.g., eastern black rail) habitat would be revegetated and restored, if necessary. • Vegetation maintenance would be conducted periodically, as necessary.
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 square meter (0.37 acres) of tidal wetland (permanent) impacts in accordance with the USACE/USEPA 2008 Compensatory Mitigation Rule as proposed. • 0.66 hectares (1.64 acres) 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 Virginia Department of Transportation (VDOT) Accomack Residency Office. • Coordination with the US Coast Guard (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.

Table 1. Summary of BMPs, Mitigation and Monitoring Measures	
Resource Area	**Measures**
Infrastructure and Utilities	• No mitigations are anticipated.
Archaeological Resources	• Work would halt and WFF Historic Preservation Officer would be contacted immediately if cultural resources are discovered during ground disturbing activities.

Conclusions

NASA requests your agency's concurrence with our revisions to the EA and that these revisions sufficiently address VDWR's concerns regarding federal consistency with the enforceable policies of Virginia's CZM Program.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Sincerely,

Shari A. Miller
Center NEPA Manager and
Environmental Planning Lead

Attachments:
Attachment 1 – NASA's Responses to VDWR Comments

cc:
250/Ms. K. Finch
250/Mr. T. Meyer
MARAD/Mr. A. Finio
USACE/Mr. S. Bahnson
VCSFA/Mr. A. Brittingham

Virginia Department of Wildlife Resources (VDWR)

Comments Received on NASA Wallops Island Northern Development Project, Federal Consistency Determination

Comment	Agency	Commenter	Topic	Recommended Changes (Exact wording of suggested Change)	Incorporated (yes/no)	How Comment was incorporated
1	VDWR (FCD)	Amy Martin	FCD - special status species	A re-evaluation of potential impacts upon sea turtles based on information provided in the attached that these animals may remain in Virginia's waters through January.	Yes	This is a follow up on a USFWS comment, which has been cited when revising the text to refer to the possibility that sea turtles could rarely be present as late as Dec – Jan
2	VDWR (FCD)	Amy Martin	FCD - special status species	To best protect sea turtles, we recommend no hydraulic hopper dredging from April 1 through November 30 of any year and no work on suitable sea turtle nesting beaches from May 1 through November 15 or until the last nest hatches or is determined unviable by an approved nest searching crew.	Yes	References to hydraulic dredging have been deleted from Section 2.3.2. as hydraulic dredging is not feasible in these shallow waters. Text has been added to Section 3.9.2.2, and other relevant sections, to explain that the proposed dredged material placement site would be within the Shoreline Enhancement and Restoration Project (SERP) area on northern Wallops Island, including the former sand borrow area at the north end of the SERP area and the renourishment areas to the south. The potential impacts from the ongoing SERP activities on sea turtles, as well as other species, were evaluated in the 2019 SERP EA and in a USFWS 2019 Biological Opinion. All Terms and Conditions of the Biological Opinion would be followed.
3	VDWR (FCD)	Amy Martin	FCD - special status species	If hopper dredges are used to deepen the channel and turning basin, we recommend that onboard environmental/biological observers are present to monitor the potential entrainment (take) of sea turtles during dredging operations, irrespective of the time of year. Transport vessels that take up a large portion of the channel may also require an onboard observer to alert the captain to the presence of sea turtles or marine mammals so that he/she can take measures to avoid a vessel strike.	Yes	References to hydraulic dredging have been deleted from Section 2.3.2. as hydraulic dredging is not feasible in these shallow waters. Onboard observers would be used during dredging and construction activities but not for normal vessel operation.
4	VDWR (FCD)	Amy Martin	FCD - special status species	We recommend close coordination with us, USFWS and NOAA Fisheries regarding the protection of sea turtles associated with all phases of this project and any future build out.	No	Comment noted. NASA and MARS will be submitting a JPA for USACE, VMRC, and DEQ permitting.
5	VDWR (FCD)	Amy Martin	FCD - special status species	We recommend that the location of any active Peregrine Falcon nests, to include the artificial nesting platform, be mapped and that no construction activities occur within 600 ft of the nest during the nesting season from February 15 through July 15 of any year.	No	Section 3.9.1.1 and Table 3.9-1 "Peregrine Falcon" state that the existing artificial nesting platform is over 3,150 ft from the Action Area. Nest platform is mapped on Figure 3.9-1.
6	VDWR (FCD)	Amy Martin	FCD - special status species	We are concerned about future development of Wallops Island and adjacent areas. These areas are known to support a number of listed species and are slowly being made unsuitable to these species because of continued expansion and shoreline stabilization activities at Wallops Flight Facility. Because the EA offers no information on how many vessels of what size will travel to and from the north end pier annually, it is difficult for us to determine what, if any, impacts upon marine animals and their habitats result from operation of the proposed facility.	Yes	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, 3.9.2.2. 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.

Virginia Department of Wildlife Resources (VDWR)
Comments Received on NASA Wallops Island Northern Development Project, Federal Consistency Determination

Comment	Agency	Commenter	Topic	Recommended Changes (Exact wording of suggested Change)	Incorporated (yes/no)	How Comment was incorporated
7	VDWR (FCD)	Amy Martin	FCD - vessels and special status species	We are concerned that the port and operations area would become part of th **e** M-95 Marine Highway Corridor, allowing for transport of large space assets and related cargo via water vessel to the north end port. While we understand the value of this facility and the need to ensure it's security and capabilities, we must ensure that any impacts upon wildlife and their habitats, including threatened or endangered species, are fully considered, that all actions are taken to avoid and minimize impacts upon them, and that any unavoidable impacts are fully compensated.	Yes	See response to Comment # 6.
8	VDWR (FCD)	Amy Martin	FCD - BMPs	We cannot make a determination of consistency until we have reviewed the Final EA for the project that includes updates to Table 4.1 *Summary of BMPs, Mitigation, and Monitoring Measures* to clearly state which time of year restrictions will be adhered to and what specific minimization methods will be employed during construction to avoid and minimize impacts upon wildlife and their habitats OR until we receive commitment from the applicant to adhere to the above recommendations and/or those offered by NOAA or the USFWS.	Yes	NASA and MARS commit to adhering to all federal and state permit and consultation-driven monitoring and mitigation. Any completed consultation and/or permit requirements will be added to Table 4.1 Additionally, see responses to Comments # 2 and 5.

Kisak, Natalie

From: Miller, Shari (WFF-2500) <shari.a.miller@nasa.gov>
Sent: Thursday, March 2, 2023 3:04 PM
To: Randy Owen
Cc: Stagg, Robert; Nettleton, Benjamin; Finch, Kimberly (GSFC-2500); Meyer, T J (WFF-2500); Finio, Alan (MARAD); Bahnson, Sara E CIV USARMY CENAO (USA); Brittingham, Alan L. (WFF-013.0)[Virginia Commercial Space Flight Authority]
Subject: NASA Wallops Flight Facility Island Northern Development, DEQ 21-164F
Attachments: NASA WFF ND - VMRC Consistency Ltr_updated_20230302.pdf

Dear Mr. Owen,

Based your agency's comments in a letter dated February 8, 2022, which was incorporated into the Federal Consistency Conditional Concurrence provided by the Virginia Department of Environmental Quality (DEQ) on February 28, 2022, regarding the draft Wallops Island Northern Development Environmental Assessment (WIND EA), NASA Wallops Flight Facility and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) are resubmitting the attached consultation. NASA and VA Space propose to construct of a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel. NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for Virginia's Coastal Zone Management (CZM) Federal Consistency Determination. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfil their requirements.

NASA believes that, given consideration of VMRC's comments and updates to the EA reflecting these recommendations, the proposed project should now be considered consistent to the maximum extent practicable with the enforceable policies of Virginia's CZM Program.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Shari A. Miller
Center NEPA Manager and
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"A single act of kindness throws out roots in all directions and the roots spring up and make new trees." – Amelia Earhart

National Aeronautics and Space Administration

Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337

Reply to Attn of: 250.W

March 2, 2023

Mr. Randy Owen
Chief, Habitat Management Division
Virginia Marine Resources Commission
380 Fenwick Road
Building 96
Fort Monroe, Virginia 23651

Re: NASA Wallops Island Northern Development Project, Federal Consistency Determination (DEQ 21-164F)

Dear Mr. Owen:

This letter is in response to your letter dated February 8, 2022, which was incorporated into the Federal Consistency Conditional Concurrence provided by the Virginia Department of Environmental Quality (DEQ) on February 28, 2022. The National Aeronautics and Space Administration (NASA) is providing a written response to the comments and recommendations contained within that letter.

As described in the Environmental Assessment (EA) and Federal Consistency Determination prepared for the NASA Wallops Island Northern Development Project, NASA Wallops Flight Facility (WFF) and the Virginia Commercial Space Flight Authority (VCSFA) propose to construct a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel. NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Federal Consistency consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfill their requirements.

The proposal by NASA generally includes the following actions: channel dredging; construction of a new pier; construction of a second hangar at the UAS Airstrip; installation of new utility infrastructure; installation of new airstrip lighting and hardening of a section of runway; improvements to the UAS Airstrip access road; construction of a new pier access road; construction of a new project support building; and construction of a new vehicle parking lot. These actions would be completed in phases. Phase 1 would include construction of all onshore components and infrastructure. Phase 2 would include extension of the fixed pier and dredging of a turning basin at the end of the pier. Phase 3 would include additional dredging of the turning basin as well as a vessel approach channel from Chincoteague Inlet Channel. All dredged material would be placed at the North Wallops Island beach borrow area to support ongoing shoreline enhancement and restoration.

NASA has prepared an EA in accordance with NEPA to analyze the potential effects of the proposed action on the environment. The EA has been tiered from the May 2019 *NASA WFF Site-Wide Programmatic Environmental Impact Statement* (Site-wide PEIS), in which NASA evaluated the environmental consequences of constructing and operating new facilities and infrastructure at WFF. As part of the EA process, NASA also prepared a Federal Consistency Determination in accordance with the Coastal Zone Management Act (CZMA) of 1972 (15 Code of Federal Regulations Part 930, Subpart C) to evaluate the reasonably foreseeable effects of the proposed project on Virginia's coastal uses or resources. The Consistency Determination was submitted to DEQ by NASA on December 16, 2021, and concluded that the proposed project would be consistent to the maximum extent practicable with the enforceable policies of Virginia's Coastal Zone Management (CZM) Program; however, in a response dated February 28, 2022, DEQ conditionally concurred with NASA's determination. DEQ received comments from various agencies within Virginia's CZM Program and provided a conditional concurrence based on NASA addressing the recommendations and obtaining necessary authorizations. Since the issuance of the conditional concurrence, NASA has revised the EA to include such considerations.

In addition, NASA has continued consultation with the U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration (NOAA) Fisheries Service under Section 7 of the Endangered Species Act (ESA) regarding potential impacts to listed species. NASA has also continued consultation with NOAA Fisheries under the Magnuson Stevens Fishery Conservation and Management Act regarding potential impacts to Essential Fish Habitat (EFH). The recommendations provided by USFWS and NOAA Fisheries have also been incorporated into the EA.

The following section describes how NASA has incorporated the Virginia Marine Resources Commission's (VMRC) comments and recommendations into the EA. The original comments provided by VMRC, and NASA's responses, are included in **Attachment 1**.

VMRC Comments on the Consistency Determination

As described above, VMRC provided comments on NASA's Consistency Determination that was submitted to the DEQ in accordance with the Virginia CZM Program. As a result of VMRC's and others' comments on the Consistency Determination, DEQ issued a conditional concurrence dependent on NASA's acceptance of the recommendations and obtainment of the necessary authorizations.

VMRC submitted a comment regarding tidal wetlands, suggesting that a wetlands permit would be required from the Accomack County Wetlands Board for impacts to tidal wetlands. VMRC also submitted a comment regarding submerged lands and dredging of Commonwealth-owned bottom material. VCSFA is still seeking appropriations and finalizing in-water design work for the pier and channel dredging. In accordance with applicable regulations under the Clean Water Act, once funding is secured and designs have progressed sufficiently for permitting, NASA and VCSFA will submit a Joint Permit Application (JPA) to VMRC to facilitate the necessary permitting for impacts to tidal wetlands and other water resources. NASA and VCSFA would comply with minimization and mitigation measures included within the permit to address impacts to wetlands, submerged lands, and other water resources throughout the project area.

VMRC submitted a comment on general permits and policies. NASA and VCSFA acknowledge the participation of state and local agencies in managing environmental resources and administering the enforceable policies of Virginia's CZM Program. NASA and VCSFA are coordinating with agencies as applicable, and will submit a JPA to VMRC to facilitate water resources permitting

VMRC submitted multiple comments on fisheries and shellfish. In order to address potential direct and indirect impacts to shellfish leases and public clam grounds, NASA and VCSFA would mitigate turbidity impacts from dredging by conducting dredging during stages of the tide that allow dredge material to settle quickly from the water column, such as during slack tide or when currents carry suspended sediment away from shellfish resources. Additionally, dredging would maintain buffers of twice the dredge cut (2x buffer) from non-vegetated tidal wetlands and four times the dredge cut (4x buffer) from vegetated tidal wetlands. NASA and VCSFA have revised their channel design impact plates to include the location of the 2x buffer and 4x buffer adjacent to shellfish leases as requested. In locations where recommended dredging during slack tide is not practical, NASA and VCSFA would employ other means to reduce turbidity moving away from the dredge such as turbidity curtains or operational Best Management Practices (BMPs) (e.g., reduced bucket ascent rates) to help protect shellfish resources.

VMRC submitted multiple comments on beaches and coastal primary sand dunes. In response to a comment on the placement location of dredged material, NASA and VCSFA have determined that all beach-quality, sandy dredged material from Phase 1 of the Proposed Action would be placed at the north Wallops Island beach borrow area to support ongoing shoreline enhancement and restoration. To the greatest extent possible, NASA and VCSFA would endeavor to coordinate dredging operations and material placement from Phase 2 and Phase 3 with ongoing WFF shoreline renourishment actions, but may be limited due to appropriations and the availability of funding. NASA has updated species tables in the EA to identify all species potentially present within the existing beach and sand dune habitat at Wallops Island.

Finally, due to the comments submitted, VMRC determined that the proposed project was not consistent with the enforceable policies over which VMRC has jurisdiction. NASA believes that, given consideration of VMRC's comments and updates to the EA reflecting these recommendations, the proposed project should now be considered consistent to the maximum extent practicable with the enforceable policies of Virginia's CZM Program.

Best Management Practices Summary

In addition to implementing minimization and mitigation measures discussed above, through EFH consultation with NOAA Fisheries, NASA and VSCFA have developed a list of BMPs to further reduce the potential for adverse impacts. This list of BMPs was developed based on routine construction best practices as well as on the results of consultation and recommendations provided by other agencies. The complete list of BMPs is included within the EA and is copied below (**Table 1**).

Table 1. Summary of BMPs, Mitigation and Monitoring Measures

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Munitions and Explosives of Concern	• A munition response plan would be developed. • Trained unexploded ordnance (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	• Stormwater Pollution Prevention Plan (SWPPP), erosion and sediment control (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 Integrated Contingency Plan (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.

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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 centimeters (12 inches) 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 and fueling and maintenance of vehicles and equipment. • Wetland ground and vegetation disturbance would be returned to pre-construction conditions, in accordance with permit requirements. • Compensate for permanent wetland impacts in accordance with the USACE/USEPA 2008 Compensatory Mitigation Rule. • 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. • Monitoring of wetlands, streambeds, channels, etc. in construction areas would occur in accordance with all project permits. • 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.
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. • Mitigation of invasive species (e.g., *Phragmites*) would occur in accordance with the *WFF Phragmites Control Plan*.

Table 1. Summary of BMPs, Mitigation and Monitoring Measures

Resource Area	Measures
Wildlife and Special Status Species	• 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, comply with time-of-year tree clearing restrictions from April 1 to November 14, and restrictions on dredge material beach placement from March 15 to August 31, or to November 30 if a sea turtle nest is discovered. • 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. • 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. • Restrictions may be placed on the number of trips taken by each vessel and shallow-draft vessels may be used for water-related projects. • Adherence of and monitoring consistent with the ICP, SWPPP, and other applicable permits and plans. • Sediment curtains could be utilized during dredging and pier construction, if necessary. • Bubble curtains could be utilized for noise attenuation during pile driving. • Special-status species (e.g., eastern black rail) habitat would be revegetated and restored, if necessary. • Vegetation maintenance would be conducted periodically, as necessary.
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 square meter (0.37 acres) of tidal wetland (permanent) impacts in accordance with the USACE/USEPA 2008 Compensatory Mitigation Rule as proposed. • 0.66 hectares (1.64 acres) 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 Virginia Department of Transportation (VDOT) Accomack Residency Office. • Coordination with the US Coast Guard (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.

Table 1. Summary of BMPs, Mitigation and Monitoring Measures

Resource Area	Measures
Infrastructure and Utilities	• No mitigations are anticipated.
Archaeological Resources	• Work would halt and WFF Historic Preservation Officer would be contacted immediately if cultural resources are discovered during ground disturbing activities.

Conclusions

NASA requests your agency's concurrence with our revisions to the EA and that these revisions sufficiently address VMRC's concerns regarding federal consistency with the enforceable policies of Virginia's CZM Program.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Sincerely,

Shari A. Miller
Center NEPA Manager and
Environmental Planning Lead

Attachments:
Attachment 1 – NASA's Responses to VMRC Comments

cc:
250/Ms. K. Finch
250/Mr. T. Meyer
MARAD/Mr. A. Finio
USACE/Mr. S. Bahnson
VCSFA/Mr. A. Brittingham

Virginia Marine Resources Commission (VMRC)
Comments Received on NASA Wallops Island Northern Development Project, Federal Consistency Determination

Comment	Agency	Commenter	Topic	Recommended Changes (Exact wording of suggested Change)	Incorporated (yes/no)	How Comment was incorporated
1	VMRC (FCD)	Randy Owen	FCD - Tidal Wetlands	A wetlands board permit with compensatory mitigation will be required from the Accomack County wetlands board for all proposed impacts to tidal wetlands.	No	Comment noted. A JPA will be filed.
2	VMRC (FCD)	Randy Owen	FCD - Submerged Lands	The project as proposed will require the dredging of 94,000 cubic yards of State-owned bottom material. The federal act of dredging, however, is not jurisdictional to VMRC based on past guidance from the Office of the Attorney General.	No	Project will be submitting a JPA for USACE, VMRC, and DEQ permitting.
3	VMRC (FCD)	Randy Owen	FCD - Fisheries and Shellfish	Private shellfish leases and public clam grounds are situated directly adjacent to the proposed channel. We cannot verify with the provided project drawings that the side slopes of the dredged channel will not directly impact lease number 22062. We have also verified that the adjacent shellfish leases 17290 and 19696 are active leases and have reported harvest.	Yes	Added to Sections 3.5.1.2 and 3.7.2.2, "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." Change 3.7.2.2. under Benthic, delete "Once specific information about dredging activities becomes available, impacts to these leased beds would need to be quantified to determine if mitigation or possible remediation measures would be required." Change to "Dredging activities would follow the existing deep water channel. As shellfish beds are limited to YY ft depth, 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: 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."
4	VMRC (FCD)	Randy Owen	FCD - Fisheries and Shellfish	Virginia Institute of Marine Science (VIMS) comments on this project report that the sandy plume from dredging is most likely to settle in areas adjacent to the channel quickly and that mitigation for sediment settling within the shellfish resource areas is needed. For this reason, we do not agree with the conclusion in the consistency report that "none of the Proposed Action Alternative activities involving disturbance of the subaqueous bottom would permanently disturb shellfish beds or affect their continued viability". Therefore, the project as proposed is not consistent with our fisheries and shellfish enforceable policies. To comply with the policies a turbidity mitigation plan is required that includes dredging on slack tides and considers turbidity curtains.	Yes	No revision to the EA is necessary. Email from E. Hein/VIMS dated 4/11/2022 stated "At this point, the hydrodynamic modeling has been done and indicates that the new dredging for the WIND project is unlikely to cause much shoaling of the existing navigation channels. Let me touch base with the modeling team and my office to figure out the best way to get that information to the appropriate regulators and also the timeline for the sediment modeling (though after seeing the results from the hydrodynamic modeling, we're not anticipating concerning results from the sediment model either). It may end up that we incorporate that information into our review of the JPA."

Virginia Marine Resources Commission (VMRC)
Comments Received on NASA Wallops Island Northern Development Project, Federal Consistency Determination

Comment	Agency	Commenter	Topic	Recommended Changes (Exact wording of suggested Change)	Incorporated (yes/no)	How Comment was incorporated
5	VMRC (FCD)	Randy Owen	FCD - Fisheries and Shellfish	Surveyed channel designs that include the location of the 2x buffer and 4x buffer adjacent to the shellfish leases are needed to understand potential direct impacts to the leases.	Yes	Change 3.7.2.2. under Benthic, change to "Dredging activities would follow the existing deep water channel. As shellfish beds are limited to YY ft depth, 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: 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." Impact plates have been revised to show 2x and 4x buffers.
6	VMRC (FCD)	Randy Owen	FDC- general permits and policies	The proposed project is within the jurisdictional areas of the Virginia Marine Resources Commission (VMRC) and the local Accomack County wetlands board. Please be advised that the VMRC pursuant to Chapters 12, 13, and 14 of Title 28.2 of the Code of Virginia administers permits required for submerged lands, tidal wetlands, and beaches and dunes. Additionally, the VMRC administers the enforceable policies of fisheries management, subaqueous lands, tidal wetlands, and coastal primary sand dunes and beaches, which comprise key components of Virginia's Coastal Zone Management Program.	No	Comment noted. NASA and MARS will be submitting a JPA for USACE, VMRC, and DEQ permitting.
7	VMRC (FCD)	Randy Owen	FCD - Beaches and Coastal Primary Sand Dunes	Section 10.1-704 of the Code of Virginia provides that the beaches of the Commonwealth shall be given priority consideration as sites for the disposal of that portion of dredged material determined to be suitable for beach nourishment. This is further supported by VMRC's "Criteria for the Placement of Sandy Dredged Material along Beaches in the Commonwealth," Regulation 4 VAC 20-400-10 ET SEQ. The project, however, proposes to dispose approximately 94,0000 cubic yards of State-owned sandy bottom material into the Atlantic Ocean. This Commonwealth of Virginia resource has a market value of between $2.35 and $3.29 million dollars, and should be utilized as nourishment material for the ongoing Wallops Island Shoreline Enhancement Restoration project at the Wallops Flight Facility. This would then offset certain of the adverse environmental impacts raised by VIMS, the Department of Wildlife Resources (DWR) and The Nature Conservancy, associated with past projects (VMRC #18-1590 and #20-1745) and future plans to excavate sandy beach material from the north end of Wallops Island.	Yes	NASA and MARS propose utilizing dredged material for onshore sand renourishment on Wallops Island. Initial dredge materials would be placed in the NASA north Wallops Island mining area (NASA, 2019). This would speed the recovery of the mined area for shoreline habitat. For future maintenance dredging, NASA and MARS may work dredge maintenance cycles to coincide with shoreline renourishment actions. Therefore, an MPRSA permit is not required.
8	VMRC (FCD)	Randy Owen	FCD - Beaches and Coastal Primary Sand Dunes	According to DWR, the beach along this segment of Wallops Island supports nesting federally Endangered Piping Plovers and American Oystercatchers, designated a Tier IIa Species of Greatest Conservation Need (SGCN). In addition, this area is believed to provide nesting habitat for state Threatened Wilson's Plovers, federally Threatened Loggerhead Sea Turtles, Diamondbacked Terrapins (Tier ll SGCN), and other species identified in Virginia's Wildlife Action Plan as SGCNs.	Yes	American oystercatcher has been added to Table 3.7-1.

Virginia Marine Resources Commission (VMRC)

Comments Received on NASA Wallops Island Northern Development Project, Federal Consistency Determination

Comment	Agency	Commenter	Topic	Recommended Changes (Exact wording of suggested Change)	Incorporated (yes/no)	How Comment was incorporated
9	VMRC (FCD)	Randy Owen	FCD - General	Given the cumulative concerns noted above, this project is viewed as not consistent with Virginia's fisheries and shellfish enforceable policies and our beaches and dunes enforceable policies.	Yes	NASA and MARS commit to adhering to all federal and state permit and consultation driven monitoring and mitigation. Any completed consultation and/or permit requirements will be added to Table 4.1

Commonwealth of Virginia

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

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February 28, 2022

Shari A. Miller
Center NEPA Manager & Environmental Planning Lead
NASA GSFC Wallops Flight Facility
Wallops Island, VA 23337
Via email: Shari.A.Miller@nasa.gov

RE: Comments on the Draft Environmental Assessment and Federal Consistency Determination for the Wallops Flight Facility Wallops Island Northern Development, National Aeronautics and Space Administration, DEQ #21-164F

Dear Ms. Miller:

The Commonwealth of Virginia has completed its review of the above-referenced documents. The Department of Environmental Quality (DEQ) is responsible for coordinating Virginia's review of federal environmental documents submitted under the National Environmental Policy Act (NEPA) and responding to appropriate federal officials on behalf of the Commonwealth. DEQ is also responsible for coordinating Virginia's review of federal consistency documents submitted pursuant to the Coastal Zone Management Act (CZMA) and providing the state's response. This is in response to the December 2021 Draft Environmental Assessment (EA) and Federal Consistency Determination (FCD) included as Appendix D submitted by the National Aeronautics and Space Administration (NASA) for the above referenced project. The following agencies participated in the review of this proposal:

Department of Environmental Quality
Department of Wildlife Resources (DWR)
Department of Historic Resources (DHR)
Department of Aviation (DOAV)
Department of Conservation and Recreation (DCR)
Department of Health (VDH)

Virginia Marine Resources Commission (VMRC)
Virginia Institute of Marine Sciences (VIMS)

In addition, the Department of Transportation, Department of Agriculture and Consumer Services, Accomack County and the Accomack-Northampton Planning District Commission were invited to comment on the proposal.

PROJECT DESCRIPTION

The National Aeronautics and Space Administration (NASA) proposes to conduct the Wallops Flight Facility Wallops Island Northern Development project on Wallops Island, Virginia. The proposed project would establish a new facility at Wallops Island as part of the Department of Transportation's Maritime Administration (MARAD) M-95 "Marine Highway Project" designed to expand the use of American's navigable waters. The new infrastructure would include a port and operations area, including enhanced operational capabilities for NASA and the Mid-Atlantic Regional Spaceport (MARS). The MARS Port, including a 398-meter fixed pier and turning basin, would be constructed on (and within the vicinity of) the Unmanned Aerial Systems (UAS) Airstrip located at the north end of Wallops Island. A variety of shallow draft manned and unmanned vessels would be serviced by the port. The project would include the dredging of a new and existing channel for enhanced vessel approach purposes. The proposed channel would have a length of approximately 3,900m and a final depth of 3.7m below mean lower low water (MLLW). The proposed width of the approach channel 30.5m is consistent with the dimensions of the Chincoteague Inlet Federal Channel. Onshore components of the project include a Project Support Building, a second hangar adjacent to the UAS airstrip, utility infrastructure, airstrip lighting, airstrip access road improvements, a vehicle parking lot, runway hardening for port access, and a new access road to the port.

In addition to the draft EA, a Federal Consistency Determination was included as Appendix D to the document. The FCD finds the proposed action consistent to the maximum extent practicable with the enforceable policies of the Virginia Coastal Zone Management Program.

FEDERAL CONSISTENCY UNDER THE COASTAL ZONE MANAGEMENT ACT

Pursuant to the Coastal Zone Management Act of 1972 (§ 1456(c)), as amended, and the federal consistency regulations implementing the CZMA (15 CFR Part 930, Subpart C, § 930.30 *et seq*.), federal actions that can have reasonably foreseeable effects on Virginia's coastal uses or resources must be conducted in a manner which is consistent, to the maximum extent practicable, with the Virginia Coastal Zone Management (CZM) Program. The CZM Program is comprised of a network of programs administered by several agencies. In order to be consistent with the CZM Program, the federal agency must obtain all the applicable permits and approvals listed under the enforceable policies of the CZM Program prior to commencing the project.

Federal Consistency Public Participation
In accordance with 15 CFR § 930.2, public notice of the proposed action was published on the DEQ website and in the OEIR Program Newsletter from December 27, 2021 to January 14, 2022. No public comments were received in response to the notice.

Federal Consistency Determination
A Federal Consistency Determination for the Wallops Flight Facility Wallops Island Northern Development project was submitted by NASA and received by DEQ on December 16, 2021. The document provided an analysis of the project's impact on the enforceable policies. According to the FCD, the project will be consistent to the maximum extent practicable with Virginia's Coastal Zone Management Program. NASA is encouraged to consider the Advisory Polices of the CZM Program as well.

The project is expected to affect the following enforceable policies: Tidal and Non-Tidal Wetlands, Wildlife and Inland Fisheries, Non-Point Source Water Pollution, Subaqueous Lands, Dunes and Beaches, Marine Fisheries, Plant Pests and Noxious Weeds, and Point Source Air Pollution. These impacts and jurisdictional agency comments, recommendations, and requirements are discussed below in the "Environmental Impacts and Mitigation" section of this document.

Federal Consistency Conditional Concurrence
Based on our review of the FCD and the comments submitted by agencies administering the enforceable policies of the CZM Program, DEQ **conditionally concurs** that the proposal will be consistent to the maximum extent practicable with the CZM Program provided all applicable permits and approvals are obtained as described below.

If, prior to construction, the project should change significantly and any of the enforceable policies of the Virginia CZM Program would be affected, pursuant to 15 CFR 930.46, the applicant must submit supplemental information to DEQ for review and approval. Additionally, other state approvals which may apply to this project are not included in this consistency concurrence. Therefore, NASA must ensure that this project is operated in accordance with all applicable federal, state and local laws and regulations.

Conditions of Concurrence with the FCD
The conditions of the Commonwealth's concurrence include the following authorizations/requirements under the Virginia CZM Program:

- In accordance with Item F. of the Marine Fisheries Enforceable Policy, any activity in the Commonwealth's tidal waters must not encroach upon the lawful use and occupation of previously leased ground for the term of the lease unless exercising riparian rights or the right of fishing. To comply with the policy a turbidity mitigation plan is required that includes dredging on slack tides and considers turbidity curtains. Additionally, surveyed channel designs that include the location of the 2x buffer and 4x buffer adjacent to the shellfish leases (22062, 17290, and 19696) are needed to understand potential direct impacts to the leases. Coordinate with VMRC to provide this necessary information. (*Va. Code Ann. §§ 28.2-101, -201, -203, -203.1, -225, -551, -600, -601, -603 -618, and -1103, -1203 and the Constitution of Virginia, Article XI, Section 3*).

- In accordance with the Threatened and Endangered Species section of the Wildlife and Inland Fisheries Enforceable Policy, "No person shall harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, possess, collect, transport, sell or offer to sell, or attempt to do so, any species of fish or wildlife listed as threatened or endangered by the Board of Game and Inland Fisheries…" To comply with the policy NASA must make updates to Table 4-1 *Summary of BMPs, Mitigation, and Monitoring Measures* to clearly state which time of year restrictions will be adhered to and what specific minimization methods will be employed during construction to avoid and minimize impacts upon wildlife and their habitats. Alternatively, NASA may coordinate with DWR to make a commitment to adhere to DWR's recommendations and/or those offered by the National Oceanic and Atmospheric Administration (NOAA) or the U.S. Fish and Wildlife Service (USFWS). (*Va. Code Ann. §§ 29.1-501, -564, -566, -567, and -568; 4 Va. Admin. Code §§ 15-20-130 and – 140).*

- In accordance with the Subaqueous Lands Enforceable Policy that states any activity affecting the subaqueous lands, including the taking and use of material from the bottomland, "…shall be guided by the Commonwealth's General Policy to conserve, develop, and utilize its natural resources, its public lands, and its historical sites and buildings and to protect its atmosphere, lands, and waters from pollution, impairment, or destruction, for the benefit, enjoyment, and general welfare of the people of the Commonwealth," the 94,000 cubic yards of subaqueous lands proposed for dredging are a State-owned resource with an approximate market value of between $2.35 and $3.29 million dollars and must be beneficially reused. The dredged material should be beneficially reused as nourishment material for the ongoing Wallops Island Shoreline Enhancement Restoration project at the Wallops Flight Facility. Coordinate with VMRC to discuss the beneficial reuse of the dredged material. (*Va. Code Ann. §§ 28.2-1200, -1203, -1204 and -1205).*

In accordance with the *Federal Consistency Regulations* 15 CFR Part 930, section 930.4, this conditional concurrence is based on the applicant obtaining the necessary authorizations prior to initiating project activities. If the requirements of section 930.4, sub-paragraphs (a)(1) through (a)(3) are not met, this conditional concurrence becomes an objection under 15 CFR Part 930, section 930.43

ENVIRONMENTAL IMPACTS AND MITIGATION

1. Surface Waters and Wetlands. The draft EA (page 3-27) notes that wetlands delineations for the study area have been completed and U.S. Army Corps of Engineers (Corps) preliminary jurisdictional determinations have been received for all wetlands. The FCD (page 16) states that the project will permanently impact 0.59 acre of tidal wetlands and temporarily impact 1.74 acre of tidal wetlands from the construction of inland support infrastructure including the proposed vehicle parking lot, culvert improvements, port access road, and the approach pier. Non-tidal wetlands will not be affected.

1(a) Agency Jurisdiction.

1(a)(i) Surface Water and Non-Tidal Wetlands. The State Water Control Board promulgates Virginia's water regulations covering a variety of permits to include the Virginia Pollutant Discharge Elimination System Permit (VPDES) regulating point source discharges to surface waters, Virginia Pollution Abatement Permit regulating sewage sludge, storage and land application of biosolids, industrial wastes (sludge and wastewater), municipal wastewater, and animal wastes, the Surface and Groundwater Withdrawal Permit, and the Virginia Water Protection (VWP) Permit regulating impacts to streams, wetlands, and other surface waters. The VWP permit is a state permit which governs wetlands, surface water, and surface water withdrawals and impoundments. It also serves as §401 certification of the federal Clean Water Act §404 permits for dredge and fill activities in waters of the U.S. The VWP Permit Program is under the Office of Wetlands and Stream Protection, within the DEQ Division of Water Permitting. In addition to central office staff that review and issue VWP permits for transportation and water withdrawal projects, the six DEQ regional offices perform permit application reviews and issue permits for the covered activities:

- Clean Water Act, §401;
- Section 404(b)(i) Guidelines Mitigation Memorandum of Agreement (2/90);
- State Water Control Law, Virginia Code section 62.1-44.15:20 *et seq*.; and
- State Water Control *Regulations*, 9 VAC 25-210-10.

1(a)(ii) Tidal Wetlands. The Virginia Marine Resources Commission (VMRC) regulates encroachments in, on or over state-owned subaqueous beds as well as tidal wetlands pursuant to Virginia Code §28.2-1200 through 1400. For nontidal waterways, VMRC states that it has been the policy of the Habitat Management Division to exert jurisdiction only over the beds of perennial streams where the upstream drainage area is 5 square miles or greater. The beds of such waterways are considered public below the ordinary high water line.

1(b) DEQ Findings. The VWP program at the DEQ Tidewater Regional Office (TRO) did not indicate that non-tidal wetlands will be affected.

1(c) VMRC Findings. VMRC reviewed the project documents and found the proposed project to be within the jurisdictional areas of the agency and the local Accomack County wetlands board.

VMRC notes that NASA has proposed to impact tidal wetlands and subaqueous bottom habitat for the construction of a fixed pier and turning basin, a hangar at the Unmanned Aerial Systems (UAS) Airstrip, installation of new utility infrastructure, installation of airstrip lighting, hardening/reinforcement of a section of the airstrip, improvements to the airstrip access road, construction of a new pier access road adjacent to the UAS Airstrip, construction of a new 20 to 30 vehicle parking lot, construction of a project support building, and channel dredging (vessel approach channel).

1(d) VIMS Comments. VIMS scientists from the departments of Physical Sciences and Fisheries Science and the Office of Research and Advisory Services contributed to a review of the proposed project.

The proposed pier will be constructed during project phases one and two, with 624 feet constructed during the first phase, and an additional 676 feet in phase two. The pier will require 400 24-foot-square pre-stressed concrete piles that will be installed with an impact hammer. The project will permanently and temporarily impact tidal wetlands.

1(e) Recommendations. VIMS recommends the development of monitoring and replanting plans for the areas of temporary impacts to vegetated tidal wetlands to ensure their recovery following construction. A *Phragmites* control plan is already in place for Wallops Island and can be applied to the proposed project.

1(f) Requirements. A wetlands board permit with compensatory mitigation will be required from the Accomack County wetlands board for all proposed impacts to tidal wetlands.

1(g) CZMA Federal Consistency. Provided the required permit(s) are obtained and complied with, this project will be consistent to the maximum extent practicable with the Tidal and Non-tidal Wetlands enforceable policy of the Virginia Coastal Zone Management (CZM) Program (see Federal Consistency under the CZMA section above (page 2) for additional information).

2. Subaqueous Lands. The draft EA (page 3-51) notes that subaqueous bottom will be disturbed during dredging, boat anchoring, and pile driving. This could deposit sediment over nearby oyster beds and interfere with respiration. Maintenance dredging in the project area would occur approximately every five years over the 30-year project life.

The FCD (page 17) states that the subaqueous bottom of surrounding tidal waters, specifically the Ballast Narrows and Chincoteague Inlet, would be disturbed during proposed construction activities. Dredging activities for the turning basin and vessel turning channel would remove up to 94,200 cubic yards of subaqueous material. The

FCD notes that the disturbance to the subaqueous bottom is temporary and that contractors would implement mitigation measures as necessary during construction to avoid and/or minimize impacts, and would incorporate and adhere to applicable BMPs, such as the use of sediment curtains, to minimize effects from subaqueous bottom disturbance.

2(a) Agency Jurisdiction. The Virginia Marine Resources Commission regulates encroachments in, on or over state-owned subaqueous beds as well as tidal wetlands pursuant to Virginia Code §28.2-1200 through 1400. For non-tidal waterways, VMRC states that it has been the policy of the Habitat Management Division to exert jurisdiction only over the beds of perennial streams where the upstream drainage area is 5 square miles or greater. The beds of such waterways are considered public below the ordinary high water line.

2(b) Agency Finding. VMRC states that the project as proposed will require the dredging of 94,000 cubic yards of State-owned bottom material with disposal of the sandy bottom into the Atlantic Ocean. The disposal of this valuable sand resource is not consistent with Virginia's Subaqueous Lands Enforceable Policy. It states any activity affecting the subaqueous lands, including the taking and use of material from the bottomland, "…shall be guided by the Commonwealth's General Policy to conserve, develop, and utilize its natural resources, its public lands, and its historical sites and buildings and to protect its atmosphere, lands, and waters from pollution, impairment, or destruction, for the benefit, enjoyment, and general welfare of the people of the Commonwealth." The dredge material has an approximate market value of between $2.35 and $3.29 million dollars, and should be utilized as nourishment material for the ongoing Wallops Island Shoreline Enhancement Restoration project at the Wallops Flight Facility.

Consistency with Virginia's Subaqueous Lands Enforceable Policy is conditioned upon the beneficial use of the 94,000 cubic yards of state owned resource as recommended by the Virginia Institute of Marine Science in their January 27, 2022 EA comments.

The federal act of dredging is not jurisdictional to VMRC based on past guidance from the Office of the Attorney General. Therefore, a VMRC subaqueous permit will not be required.

2(c) VIMS Comments. Dredging will occur during phases one and three, with the initial dredging of the channel and turning basin to nine feet below mean lower low water (MLLW). Phase three operations will extend the channel depth to 12 feet MLLW and dredge a new turning basin to coincide with the end of the extended pier (constructed during phase two). The total volume of dredged material is estimated to be 94,000 cubic yards and the geotechnical investigation indicates it is approximately 95% sand. Dredging the new channel will provide an additional path for tidal exchange between Chincoteague Inlet and the marshes and lagoons landward of Wallops and Chincoteague islands. Consequently, the flow through Chincoteague Channel (federal channel authorized to 12 feet, maintained to 9 feet) will be reduced and the channel may therefore shoal and require more frequent maintenance dredging. Hydrodynamic modeling is required to estimate the extent of this potential shoaling. VIMS is the lead institution on the Commonwealth-funded *Chincoteague Inlet Modeling Study (CIMS)*, which is developing a wave, hydrodynamic, and multi-class sediment-transport numerical model of the Inlet and adjacent barrier islands, including the area to be impacted by the proposed NASA channel. Modeled scenarios incorporate the proposed dredging activities.

2(d) Recommendations.

2(d)(i) VMRC Recommendations. Of the five placement sites in the EA, VMRC recommends the material be placed on the shoreline of Wallops Island.

2(d)(ii) VIMS Recommendations. VIMS notes that the sandy material is anticipated to settle quickly, so the use of a turbidity curtain around the dredging operations is recommended only when they are in close proximity to shellfish resources. If the use of turbidity curtains is not possible due to current velocities, VIMS recommends consideration of dredging the during slack tides and the western portion of the channel during flood tide and the eastern portion of the channel during ebb tides.

VIMS recommends adherence to the standard dredge buffers of a minimum of twice the dredge cut from non-vegetated tidal wetlands and four times the dredge cut from vegetated tidal wetlands.

VIMS expects preliminary results of CIMS within the next couple of months, and can share those findings with NASA and the regulatory community. The results of CIMS should provide information regarding the full impacts from this project and VIMS recommends consideration of delaying action until these results are available.

2(e) CZMA Federal Consistency. Beneficial reuse of the dredged subaqueous lands, a state-owned resource, is required in order for the project to be consistent to the maximum extent practicable with the Subaqueous Lands enforceable policy of the Virginia CZM Program (see Federal Consistency **Conditional Concurrence** under the CZMA section above (page 3) for additional information).

3. Air Pollution. The FCD (page 20) states that minor air pollution increases would result from the operation of construction equipment. Short-term effects would be minimized by using best management practices (BMPs) to control fugitive dust, minimize equipment and vehicle idling, and properly maintaining equipment in optimal condition. No open burning is proposed.

The draft EA (page 1-6) notes that the reducing air emissions by removing potentially hazardous and less efficient transportation operations off of roadways is part of the purpose of the project. Table 3-1 indicates that temporary emissions from the project will not have a significant impact on regional air quality.

3(a) Agency Jurisdiction. The DEQ Air Division, on behalf of the State Air Pollution Control Board, is responsible for developing regulations that implement Virginia's Air Pollution Control Law (Virginia Code §10.1-1300 *et seq.*). DEQ is charged with carrying out mandates of the state law and related regulations as well as Virginia's federal obligations under the Clean Air Act as amended in 1990. The objective is to protect and enhance public health and quality of life through control and mitigation of air pollution. The division ensures the safety and quality of air in Virginia by monitoring and analyzing air quality data, regulating sources of air pollution, and working with local, state and federal agencies to plan and implement strategies to protect Virginia's air quality. The appropriate DEQ regional office is directly responsible for the issuance of necessary permits to construct and operate all stationary sources in the region as well as monitoring emissions from these sources for compliance. In the case of certain projects, additional evaluation and demonstration must be made under the general conformity provisions of state and federal law.

The Air Division regulates emissions of air pollutants from industries and facilities and implements programs designed to ensure that Virginia meets national air quality standards. The most common regulations associated with major projects are:

- Open burning: 9 VAC 5-130 *et seq.*
- Fugitive dust control: 9 VAC 5-50-60 *et seq.*
- Permits for fuel-burning equipment: 9 VAC 5-80-1100 *et seq.*

3(b) Agency Findings. According to the DEQ Air Division, the project site is located in a designated ozone non-attainment area and an emission control area for oxides of nitrogen (NOx) and volatile organic compounds (VOCs).

3(c) Requirements.

3(c)(i) Fugitive Dust. During land-disturbing activities, fugitive dust must be kept to a minimum by using control methods outlined in 9VAC5-50-60 *et seq*. of the Regulations for the Control and Abatement of Air Pollution. These precautions include, but are not limited to, the following:

- Use, where possible, of water or suitable chemicals for dust control during the proposed demolition and construction operations and from material stockpiles;
- Installation and use of hoods, fans and fabric filters to enclose and vent the handling of dusty materials;
- Covering of open equipment for conveying materials; and
- Prompt removal of spilled or tracked dirt or other materials from paved streets and removal of dried sediments resulting from soil erosion.

3(c)(ii) Fuel-Burning Equipment. Fuel-burning equipment (boilers, generators, compressors, etc.) or any other air-pollution-emitting equipment may be subject to registration or permitting requirements under 9 VAC5-80, Article 6, Permits for New and Modified Sources.

3(c)(iii) Open Burning. If project activities include the open burning of construction material or the use of special incineration devices, this activity must meet the requirements under 9 VAC 5-130 *et seq.* of the *Regulations* for open burning, and may require a permit. The *Regulations* provide for, but do not require, the local adoption of a model ordinance concerning open burning. The applicant should contact local fire officials to determine what local requirements, if any, exist.

3(c)(iv) Asphalt Paving. A precaution, which typically applies to road construction and paving work (9 VAC 5-45-780 *et seq*.), places limitations on the use of "cut-back" (liquefied asphalt cement, blended with petroleum solvents), and may apply to the project. The asphalt must be "emulsified" (predominantly cement and water with a small amount of emulsifying agent) except when specified circumstances apply. Moreover, there are time-of-year restrictions on its use from April through October in VOC emission control areas.

3(d) Agency Recommendation. Take precautions to limit the emissions of VOCs and NOx during construction, principally by controlling or limiting the burning of fossil fuels.

3(e) CZMA Federal Consistency. The project will be consistent to the maximum extent practicable with the Point Source Air Pollution enforceable policy of the CZM Program, provided adherence to the above requirements (see Federal Consistency under the CZMA section above (page 2) for additional information).

4. Solid and Hazardous Wastes and Materials. Table 3-1 in the draft EA (page 3-2) indicates that the project will not generate significant amounts of hazardous waste such that human health or the environment will be affected. Any waste generated will be properly handled.

4(a) Agency Jurisdiction. On behalf of the Virginia Waste Management Board, the DEQ Division of Land Protection and Revitalization is responsible for carrying out the mandates of the Virginia Waste Management Act (Virginia Code §10.1-1400 *et seq*.), as well as meeting Virginia's federal obligations under the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response Compensation Liability Act (CERCLA), commonly known as Superfund. The DEQ Division of Land Protection and Revitalization (DLPR) also administers those laws and regulations on behalf of the State Water Control Board governing Petroleum Storage Tanks (Virginia Code §62.1-44.34:8 *et seq*.), including Aboveground Storage Tanks (9VAC25-91 *et seq*.) and Underground Storage Tanks (9VAC25-580 *et seq*. and 9VAC25-580-370 *et seq*.), also known as 'Virginia Tank Regulations', and § 62.1-44.34:14 et seq. which covers oil spills.

Virginia:

- Virginia Waste Management Act, Virginia Code § 10.1-1400 *et seq.*
- *Virginia Solid Waste Management Regulations*, 9 VAC 20-81
    - (9 VAC 20-81-620 applies to asbestos-containing materials)
- *Virginia Hazardous Waste Management Regulations*, 9 VAC 20-60
    - (9 VAC 20-60-261 applies to lead-based paints)
- *Virginia Regulations for the Transportation of Hazardous Materials*, 9 VAC 20-110.

Federal:

- Resource Conservation and Recovery Act (RCRA), 42 U.S. Code sections 6901 *et seq.*
- U.S. Department of Transportation *Rules for Transportation of Hazardous Materials*, 49 *Code of Federal Regulations*, Part 107
- Applicable rules contained in Title 40, *Code of Federal Regulations*.

4(b) Agency Finding. The DEQ TRO states that DEQ records do not indicate any reported petroleum releases within the proposed project footprint. The DLPR staff conducted a search (200 ft radius) of the project areas of solid and hazardous waste databases (including petroleum releases) to identify waste sites in close proximity to the project areas. DLPR identified one RCRA Large Quantity Generator, one RCRA Small Quantity Generator, one Voluntary Remediation Program (VRP) site, and 26 petroleum release sites within the project area which might impact the project.

RCRA Large Quantity Generator and RCRA Small Quantity Generator located at Wallops Flight Facility:

1. Registry ID: 110000607488, US NASA GSFC WALLOPS FLIGHT FACILITY, WALLOPS FLIGHT FACILITY, WALLOPS ISLAND, VA 23337.

2. Registry ID: 110070828367, U.S. NASA GSFC WALLOPS FLIGHT FACILITY, 34200 FULTON STREET, WALLOPS FLIGHT FACILITY, WALLOPS ISLAND, VA 23337.

Voluntary Remediation Program Site located at Wallops Flight Facility:
Site Number: VRP00662, NASA Wallops WFF Pad 0A, Wallops Island, Virginia, 23337. Primary Status: Certificate Issued. Secondary Status: Refer to Certificate Status.

Petroleum Release Sites: Twenty-six petroleum release sites were identified at NASA Wallops Flight Facility. Refer to the attached memorandum dated January 10, 2022 for a list of the sites.

The petroleum release cases identified should be further evaluated by the project engineer or manager to establish the exact location, nature and extent of the petroleum release and the potential to impact the proposed project. In addition, the project engineer or manager should contact the DEQ's Tidewater Regional Office at (757) 518-2000 (Tanks Program) for further information about the cases.

4(c) Requirements.

4(c)(i) Waste Management. Any soil that is suspected of contamination or wastes that are generated during construction must be tested and disposed of in accordance with applicable federal, state, and local laws and regulations. All construction and demolition debris must be characterized in accordance with the *Virginia Hazardous Waste Management Regulations* prior to disposal at an appropriate facility. It is the generator's responsibility to determine is a solid waste meets the criteria of a hazardous waste and to manage the waste appropriately.

4(c)(ii) Petroleum Releases and Storage Tanks. If evidence of a petroleum release is discovered, it must be reported to DEQ, as authorized by Virginia Code § 62.1-44.34.8 through 9 and 9 VAC 25-580-10 *et seq*.

Installation and operation of any regulated petroleum storage tank(s) either aboveground storage tanks (AST) or underground storage tanks (UST) must also be conducted in accordance with the Virginia Regulations 9 VAC 25-91-10 *et seq.* and / or 9 VAC 25-580-10 *et seq*.

4(c)(iii) Asbestos Containing Materials and Lead-based Paint. All structures being demolished/renovated/removed must be checked for asbestos-containing materials (ACM) and lead-based paint (LBP) prior to demolition. If ACM or LBP materials are identified all federal and state requirements must be followed.

4(d) Pollution Prevention Recommendation. DEQ recommends that NASA implement pollution prevention principles, including the reduction, reuse, and recycling of all solid wastes generated. All generation of hazardous wastes should be minimized and handled appropriately.

5. Natural Heritage Resources. The draft EA (page 3-45) states that the proposed project will have minor, short-term impacts on terrestrial wildlife resulting from the removal of habitat as well as disturbance and displacement by construction activities. Following the cessation of construction activities, it is expected that many species would return to the remaining habitats in and around the project area. The phased implementation of the project would distribute potential impacts on wildlife over multiple years.

5(a) Agency Jurisdiction.

5(a)(i) The Virginia Department of Conservation and Recreation's (DCR) Division of Natural Heritage (DNH). DNH's mission is conserving Virginia's biodiversity through inventory, protection and stewardship. The Virginia Natural Area Preserves Act (Virginia Code §10.1-209 through 217), authorized DCR to maintain a statewide database for conservation planning and project review, protect land for the conservation of biodiversity, and the protect and ecologically manage the natural heritage resources of Virginia (the habitats of rare, threatened and endangered species, significant natural communities, geologic sites, and other natural features).

5(a)(ii) Virginia Department of Agriculture and Consumer Services (VDACS): The Endangered Plant and Insect Species Act of 1979 (Virginia Code Chapter 39 §3.1-1020 through 1030) authorizes VDACS to conserve, protect and manage endangered and threatened species of plants and insects. Under a Memorandum of Agreement established between VDACS and the DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species.

5(b) Agency Findings. DCR's Division of Natural Heritage (DNH) searched its Biotics Data System (Biotics) for occurrences of natural heritage resources from the area outlined on the submitted map. According to the information currently in Biotics, the Wallops – Assawoman Islands Conservation Site is located within the project site. Wallops – Assawoman Islands Conservation Site has been given a biodiversity significance ranking of B2, which represents a site of very high significance. The natural heritage resources of concern at this site are: A Eupatorium (*Eupatorium maritimum*, G2?/S1?/SOC/NL) and Black Cherry Xeric Dune Woodland (G1G2/S1/NL/NL).

A Eupatorium is a rare plant that occurs in interdunal swales in coastal Virginia and the Outer Banks region of North Carolina. The Maritime Dune Woodland is a tall, deciduous, maritime shrubland or scrub forest of the mid-Atlantic coast, although physiognomy can vary dramatically, ranging from open woodland to stunted forest to dense nearly impenetrable thicket. Occurrences are naturally small (a few acres), confined to the oceanward portion of barrier islands. Potential or historic habitat has been reduced by extensive human development such as residential or commercial building, recreation, or road expansion. Refer to the attached memorandum dated January 14, 2022 for more details about these resources.

As stated on page 3-39 of the "*Draft Wallops Island Northern Development Environmental Assessment*" dated December 2021, the Black Cherry Xeric Dune Woodland significant natural community would be impacted by the permanent removal of approximately 0.59 acre of woodland for the proposed construction of Hangar 2.

5(b)(i) State-listed Plant and Insect Species. DCR found that the proposed project will not affect any documented state-listed plants or insects.

5(b)(ii) State Natural Area Preserves. There are no State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

5(c) Recommendations. DCR recommends limiting impacts to the Black Cherry Xeric Dune Woodland significant natural community to the greatest extent possible.

Due to the documented occurrence of A Eupatorium within the project area and the potential for additional occurrences of A Eupatorium to occur within the project site, DCR recommends an inventory for the resource in the runway margins and also recommends surveying the known occurrence at the east end of the existing runway to determine the current extent of the population. DCR-Division of Natural Heritage biologists are qualified to conduct inventories for rare, threatened, and endangered species.

Contact DCR-DNH to secure updated information on natural heritage resources if the scope of the project changes and/or six months has passed before it is utilized. New and updated information is continually added to the Biotics Data System.

6. Floodplain Management. The Draft EA (page 3-31) indicates that all of Wallops Island is within a special flood hazard area subject to inundation by the 1 percent annual chance flood. The functionality of the floodplain would not be reduced by implementation of the proposed project.

6(a) Agency Jurisdiction. The DCR Division of Dam Safety and Floodplain Management (DSFM) is the lead coordinating agency for the Commonwealth's floodplain management program and the National Flood Insurance Program (Executive Oder 45). The National Flood Insurance Program (NFIP) is administered by the Federal Emergency Management Agency (FEMA), and communities who elect to participate in this voluntary program manage and enforce the program on the local level through that community's local floodplain ordinance. Each local floodplain ordinance must comply with the minimum standards of the NFIP, outlined in 44 CFR 60.3; however, local communities may adopt more restrictive requirements in their local floodplain ordinance, such as regulating the 0.2% annual chance flood zone (shaded Zone X).

6(b) Requirements. All development within a Special Flood Hazard Area (SFHA) or floodplain, as shown on the locality's Flood Insurance Rate Map (FIRM), must be permitted and comply with the requirements of the local floodplain ordinance. Projects conducted by federal agencies within the SFHA must comply with federal Executive Order 11988: Floodplain Management.

DCR's Floodplain Management Program does not have regulatory authority for projects in the SFHA. NASA is encouraged reach out to the local floodplain administrator to ensure compliance with the local floodplain ordinance.

6(c) Recommendation. DCR recommends NASA access the Virginia Flood Risk Information System (VFRIS) to find flood zone information.

7. Wildlife and Inland Fisheries. The draft EA (page 3-40) notes that both terrestrial and aquatic species occur in and around the project area. The impact on terrestrial wildlife would be minor and short-term associated with disturbance from construction. Following completion of construction it is expected that many species would return to the remaining habitats in and around the project area. The draft EA notes that the phases approach to construction would distribute impacts to wildlife over multiple years.

The FCD (page 19) states that the project area provides potential habitat for 18 federal or state-listed species. Construction and operation activities would not involve the intentional disturbance, harassment, or "take" of any listed species, nor would activities occur in areas of Wallops Island offering suitable nesting or breeding habitat for listed birds, sea turtles, or fish.

7(a) Agency Jurisdiction. DWR, as the Commonwealth's wildlife and freshwater fish management agency, exercises enforcement and regulatory jurisdiction over wildlife and freshwater fish, including state- or federally-listed endangered or threatened species, but excluding listed insects (Virginia Code, Title 29.1). DWR is a consulting agency under the U.S. Fish and Wildlife Coordination Act (16 U.S. Code §661 *et seq*.) and provides environmental analysis of projects or permit applications coordinated through DEQ and several other state and federal agencies. DWR determines likely impacts upon fish and wildlife resources and habitat, and recommends appropriate measures to avoid, reduce or compensate for those impacts. For more information, see the DWR website at *www.dwr.virginia.gov.*

7(b) DWR Findings. DWR reviewed the Environmental Assessment/FCD for proposed activities at the north end of Wallops Flight Facility in Accomack County. The proposed alternative, which is broken into three phases, includes development of an up to 1305-foot pier and turning basin along with the development of onshore infrastructure. DWR documents federal-listed Threatened Loggerhead Sea Turtles, federal-listed Threatened Piping Plovers, state-listed Threatened Peregrine Falcons, and state-listed Threatened Gull-billed Terns from the project area. Depending on the habitat available on site these species may be present within proposed work areas, at least during certain times of year. It appears the listed species potentially present have been correctly captured in Table 3.9.1 *Federally and State Listed Species with Potential to Occur in the Project Area and Determination of Effects*. However, DWR notes that Table 3.7.1 *Terrestrial Wildlife Species with Potential to Occur in the Project Area* and Table 3.9.1 is missing these species and others that may occur in the project area.

DWR is concerned about future development of Wallops Island and adjacent areas. These areas are known to support a number of listed species and are slowly being made unsuitable to these species because of continued expansion and shoreline stabilization activities at Wallops Flight Facility. Because the EA offers no information on how many vessels of what size will travel to and from the north end pier annually, it is difficult for DWR to determine what, if any, impacts upon marine animals and their habitats result from operation of the proposed facility. In addition, DWR is concerned that the port and operations area would become part of the M-95 Marine Highway Corridor, allowing for transport of large space assets and related cargo via water vessel to the north end port. While DWR understands the value of this facility and the need to ensure its security and capabilities, we must ensure that any impacts upon wildlife and their habitats, including threatened or endangered species, are fully considered, that all actions are taken to avoid and minimize impacts upon them, and that any unavoidable impacts are fully compensated.

In accordance with the Threatened and Endangered Species section of the Wildlife and Inland Fisheries Enforceable Policy "No person shall harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, possess, collect, transport, sell or offer to sell, or attempt to do so, any species of fish or wildlife listed as threatened or endangered by the Board of Game and Inland Fisheries…" To comply with the policy NASA must make updates to Table 4-1 *Summary of BMPs, Mitigation, and Monitoring Measures* to clearly state which time of year restrictions will be adhered to and what specific minimization methods will be employed during construction to avoid and minimize impacts upon wildlife and their habitats. Alternatively, NASA may coordinate with DWR to make a commitment to adhere to DWR's recommendations and/or those offered by the National Oceanic and Atmospheric Administration (NOAA) or the U.S. Fish and Wildlife Service (USFWS).

7(c) DWR Recommendations.

7(c)(i) Species Search. DWR recommends that NASA and/or its agents conduct a preliminary desktop analysis to evaluate potential impacts upon the Commonwealth's wildlife resources by accessing DWR's online information system, the Virginia Fish and Wildlife Information Service (VAFWIS) and using the Geographic Search function to generate an Initial Project Assessment (IPA) report and use the species list generated to fill out this table. One may access VAFWIS at https://vafwis.DWR.virginia.gov/fwis/.

Alternatively, NASA may contact DWR's Geographic Information Systems (GIS) Coordinator, Jay Kapalczynski (Jay.Kapalczynski@DWR.virginia.gov) to request access to the Wildlife Mapping and Environmental Review Map Service (WERMS) that allows one to download GIS data into your own system.

DWR recommends accessing information about the location of bat hibernacula and roosts and Bald Eagle nest locations from the following:

- Northern Long-Eared Bats: https://www.dwr.virginia.gov/wildlife/bats/northern-long-eared-bat-application/;
- Little Brown Bats and Tricolored Bats: https://www.dwr.virginia.gov/wildlife/bats/little-brown-bat-tri-colored-bat-winter-

habitat-roosts-application/; and
- The Center for Conservation Biology's Eagle Nest Locator: https://ccbbirds.org/what-we-do/research/species-of-concern/virginia-eagles/nest-locator/.

7(c)(ii) Sea Turtles. The draft EA states that sea turtles are only likely to be present in the Project Area from May through November of any year. While that may historically have been true, Virginia's coastal waters now remain warm enough long enough for sea turtles to still be present well into December and January. This is evidenced by the increasing numbers of cold-stunned turtle strandings reported by the Virginia Aquarium Stranding Response Program during these months. DWR recommends consideration of this information and a re-evaluation of potential impacts upon sea turtles in light of this information.

DWR also recommends no hydraulic hopper dredging in the project area from April 1 through November 30 of any year. In addition, DWR recommends no work on suitable sea turtle nesting beaches from May 1 through November 15 or until the last nest hatches or is determined unviable by an approved nest searching crew.

If hopper dredges are used to deepen the channel and turning basin, DWR recommends that on board environmental/biological observers are present to monitor the potential entrainment (take) of sea turtles during dredging operations, irrespective of the time of year. Transport vessels that take up a large portion of the channel may also require an onboard observer to alert the captain to the presence of sea turtles or marine mammals so that he/she can take measures to avoid a vessel strike.

DWR recommends close coordination with this agency, the USFWS (Troy Andersen, troy_andersen@fws.gov) and NOAA Fisheries (Christine Vaccaro, christine.vaccaro@noaa.gov) regarding the protection of sea turtles associated with all phases of this project and any future build out.

7(c)(iii) Peregrine Falcon. DWR recommends that the location of any active Peregrine Falcon nests, to include the artificial nesting platform, be mapped and that no construction activities occur within 600 feet of the nest during the nesting season from February 15 through July 15 of any year.

7(c)(iv) Beneficial Use of Dredged Materials. It appears NASA proposes to place their dredged materials in the Open Ocean Dredge Material Placement Area, at least for initial dredging. DWR strongly recommends that NASA work with this agency and its conservation partners to find a beneficial use for that material and perhaps material surfaced by future dredging onsite. NASA has, over the years as the result of many projects, adversely impacted shoreline and nearshore habitats. Using dredged materials to restore some of that impacted habitat or other similarly impacted habitats would be of great benefit to the region and the species that use these impacted habitats.

7(c)(v) General Recommendations. DWR recommends that NASA update Table 4.*1 Summary of BMPs, Mitigation, and Monitoring Measures* to indicate what time of year restrictions they will adhere to, what specific minimization methods will be employed during construction to avoid and minimize impacts upon wildlife and their habitats, and what types of vessel restrictions will be in place. Currently this table only speaks very generally to what mitigation measures may be in place.

DWR recommends:

- Conducting any in-stream activities during low or no-flow conditions, using non-erodible cofferdams or turbidity curtains to isolate the construction area, blocking no more than 50% of the streamflow at any given time (minimal overlap of construction footprint notwithstanding);
- Stockpiling excavated material in a manner that prevents reentry into the stream.
- Restoring original streambed and streambank contours, and revegetating barren areas with native vegetation;
- Implementing strict erosion and sediment control measures;
- Designing and performing instream work in a manner that minimizes impacts upon natural streamflow and movement of resident aquatic species;
- If a dam and pump-around must be used, DWR recommends it be used for as limited a time as possible and that water returned to the stream be free of sediment and excess turbidity.
- Utilizing matting made from natural/organic materials such as coir fiber, jute, and/or burlap, to minimize potential wildlife entanglements resulting from use of synthetic/plastic erosion and sediment control matting.

To minimize harm to the aquatic environment and its residents resulting from use of the Tremie method to install concrete, installation of grout bags, and traditional pouring of concrete, DWR recommends that such activities occur only in the dry, allowing all concrete to harden and cure prior to contact with open water. Due to future maintenance costs associated with culverts, and the loss of riparian and aquatic habitat, DWR prefers stream crossings to be constructed via clear-span bridges. However, if this is not possible, DWR recommends countersinking any culverts below the streambed at least 6 inches, or the use of bottomless culverts, to allow passage of aquatic organisms. DWR also recommends the installation of floodplain culverts to carry bankfull discharges.

Additionally, DWR offers the following recommendations to minimize overall impacts of development activities to wildlife and natural resources:

- Avoid and minimize impacts to undisturbed forest, wetlands, and streams to the fullest extent practicable. Avoidance and minimization of impact may include relocating stream channels, as opposed to filling or channelizing, as well as using and incorporating into the development plan, a natural stream channel design and forested riparian buffers.

- Maintain undisturbed naturally vegetated buffers of at least 100 feet in width around all on-site wetlands and on both sides of all perennial and intermittent streams.
- Maintain wooded lots to the fullest extent possible.
- Adhere to a time-of-year restriction for tree removal and ground clearing that is protective of resident and migratory songbird nesting from March 15th through August 15th of any year.
- Adhere to erosion and sediment controls during ground disturbance.
- Design stormwater controls to replicate and maintain the hydrographic condition of the sites prior to the change in landscape. This should include, but not be limited to, utilizing bioretention areas, and minimizing the use of curb and gutter in favor of grassed swales. Bioretention areas (also called rain gardens) and grass swales are components of Low Impact Development (LID). They are designed to capture stormwater runoff as close to the source as possible and allow it to slowly infiltrate into the surrounding soil. They benefit natural resources by filtering pollutants and decreasing downstream runoff volumes.

7(d) CZMA Federal Consistency. Further coordination with DWR and submission of additional information regarding which time of year restrictions will be adhered to and what specific minimization methods will be employed during construction to avoid and minimize impacts upon wildlife and their habitats is required in order for the project to be consistent to the maximum extent practicable with the Wildlife and Inland Fisheries enforceable policy of the Virginia CZM Program (see Federal Consistency **Conditional Concurrence** under the CZMA section above (page 3) for additional information).

8. Marine Fisheries. The draft EA (page 3-46) states that 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. Mobile species are likely to avoid the project area during construction activities. Less-mobile species (e.g., benthic organisms) could be 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.

The draft EA (page 3-51) notes that 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 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.

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 approximately every five years over the 30-year project life and none of the long-term operational activities associated with the project would prevent or impede the continued viability of the nearby oyster beds.

The FCD (page 18) notes that both construction and operation have the potential to affect commercial and recreational marine fisheries by disturbing fish populations and interfering with local fishing and harvesting activities. Various commercial fishing entities are located north of Wallops Island, and likely fish in the waters adjacent to the project site, along with recreational fishermen.

8(a) Agency Jurisdiction. The policy stresses the conservation and promotion of seafood and marine resources of the Commonwealth, including fish, shellfish and marine organisms, and manage the fisheries to maximize food production and recreational opportunities within the Commonwealth's territorial waters. The policy is administered by VMRC (*Virginia Code §§ 28.2-101, -201, -203, -203.1, -225, -551, -600, -601, -603 -618, and -1103, -1203 and the Constitution of Virginia, Article XI, Section 3*).

8(b) Agency Finding. VMRC states that rivate shellfish leases and public clam grounds are situated directly adjacent to the proposed channel. VMRC cannot verify with the provided project drawings that the side slopes of the dredged channel will not directly impact lease number 22062. VMRC has also verified that the adjacent shellfish leases 17290 and 19696 are active leases and have reported harvest. Additionally, Virginia Institute of Marine Science (VIMS) comments on this project report that the sandy plume from dredging is most likely to settle in areas adjacent to the channel quickly and that mitigation for sediment settling within the shellfish resource areas is needed.

For this reason, VMRC does not agree with the conclusion in the consistency report that "none of the Proposed Action Alternative activities involving disturbance of the subaqueous bottom would permanently disturb shellfish beds or affect their continued viability". Therefore, the project as proposed is not consistent with Marine Fisheries enforceable policy.

In accordance with Item F. of the Marine Fisheries Enforceable Policy, any activity in the Commonwealth's tidal waters must not encroach upon the lawful use and occupation of previously leased ground for the term of the lease unless exercising riparian rights or the right of fishing. To comply with the policy a turbidity mitigation plan is required that includes dredging on slack tides and considers turbidity curtains. Additionally, surveyed channel designs that include the location of the 2x buffer and 4x buffer adjacent to the shellfish leases (22062, 17290, and 19696) are needed to understand potential direct impacts to the leases.

8(c) CZMA Federal Consistency. Further coordination with VMRC and submission of additional information regarding a turbidity mitigation plan and surveyed channel deigns with buffer locations is required in order for the project to be consistent to the maximum extent practicable with the Marine Fisheries enforceable policy of the Virginia CZM Program (see Federal Consistency **Conditional Concurrence** section above (page 3) for additional information).

9. Dunes and Beaches. According to the FCD (page 17), no sand dunes or beaches are present within the project area and would not be affected by proposed construction or operation activities associated with the project. Depending on which placement site is selected, dredge material could be placed along the sandy shoreline in the southern portion of Wallops Island to serve as beach replenishment material and to protect the beach from tidal impacts (Placement Option 4: Wallops Island Shoreline Protection Placement).

However, the draft EA (page 2-10) discusses five placement options, with Option 1 Wallops Open Ocean Dredge Material Placement Area, being the selected option for the initial dredging. When compared to Options 2-5, 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 (page 2-12). The Open Ocean site is also the fastest path towards construction as it is already permitted by the Corps and has capacity for the proposed initial dredge material.

9(a) Agency Jurisdiction. The policy promotes the preservation and protection of coastal primary sand dunes and beaches, to prevent their despoliation and destruction, and whenever practical, to accommodate necessary economic development in a manner consistent with the protection of such features. Dune and beach protection is carried out pursuant to the Coastal Primary Sand Dune Protection Act as administered by VMRC (*Virginia Code §§ 28.2-1401 and -1408*).

9(b) Agency Finding. No impacts to jurisdictional beaches and dunes are proposed; however, as noted in the Subaqueous Lands section above, VMRC recommends that any sandy dredged material be used beneficially. Beaches of the Commonwealth should be given priority consideration as sites for the disposal of that portion of dredged material determined to be suitable for beach nourishment. This is supported by Section 10.1-704 of the Code of Virginia, which states that beaches of the Commonwealth shall be given priority consideration as sites for the disposal of that portion of dredged material determined to be suitable for beach nourishment. This is further supported by VMRC's "Criteria for the Placement of Sandy Dredged Material along Beaches in the Commonwealth," Regulation 4 VAC 20-400-10 *et seq*.

The use of dredged sandy material from this project as beach nourishment at the south end of the island would offset certain of the adverse environmental impacts raised by VIMS, DWR, and The Nature Conservancy, associated with past projects (VMRC #18-

1590 and #20-1745) and future plans to excavate sandy beach material from the north end of Wallops Island.

According to DWR, the beach along this segment of Wallops Island supports nesting federally Endangered Piping Plovers and American Oystercatchers, designated a Tier IIa Species of Greatest Conservation Need (SGCN). In addition, this area is believed to provide nesting habitat for state Threatened Wilson's Plovers, federally Threatened Loggerhead Sea Turtles, Diamondbacked Terrapins (Tier II SGCN), and other species identified in Virginia's Wildlife Action Plan as SGCNs.

9(c) VMRC Recommendation. VMRC recommends that any sandy dredged material be beneficially reused, preferably on the shoreline of Wallops Island.

9(d) VIMS Comments and Recommendations. The dredged material is proposed to be placed in the Wallops Open Ocean Disposal site primarily because it is the least expensive alternative of the five evaluated in the EA. However, the costs considered are only those related to dredging and placement of the sediment, and discounted any future costs of continued erosion control and resilience activities that may be postponed or prevented should the dredged material be used beneficially. Of the five sites in the EA, VIMS recommends the material be placed on the shoreline of Wallops Island. This sand could be used to nourish the beach in general and/or specifically the area of recent beach sand removal at the northern end of the beach and landward of the large breakwaters (as we recommended during the review of that project). This sand would help stabilize Wallops Island and serve as a sediment source to the downdrift barrier islands, thereby benefiting this entire coastal system. VIMS considers placement at Chincoteague National Wildlife Refuge Swan Cove a second choice for the beneficial use of the dredged material should beach placement not be possible.

An alternative not discussed in the EA, and the VIMS highest recommended option, is to rebuild Chincoteague Point, a small marsh island across the channel southwest of Curtis Merritt Harbor at the south end of Chincoteague Island. This island provides some protection to the harbor and southern Chincoteague and has eroded significantly over the past 15 years, thereby increasing exposure of southern Chincoteague to high-energy waves from Chincoteague Inlet. Restoring the island would require marsh plantings and shoreline stabilization (e.g. a stone sill) in addition to the dredged sediment. While considering an additional beneficial placement site, particularly one involving restoration of part of an island, is complicated and must be done with care, the benefits of restoring the protection provided by this island may prove beneficial to the longer-term resilience of Chincoteague. VIMS recommends that the impacts of restoring this island are modeled as part of an alternatives analysis for determining a placement site.

9(e) CZMA Federal Consistency. This project is consistent to the maximum extent practicable with the Dunes and Beaches Enforceable Policy of the Virginia CZM Program (see Federal Consistency under the CZMA section above (page 2) for additional information).

10. Public Water Supply. The draft EA (page 3-25) notes that Wallops Flight Facility 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. With the implementation of spill prevention measures, no adverse short-term or long-term effects to groundwater resources are anticipated.

10(a) Agency Jurisdiction. The Virginia Department of Health (VDH) Office of Drinking Water (ODW) reviews projects for the potential to impact public drinking water sources (groundwater wells, springs and surface water intakes). VDH administers both federal and state laws governing waterworks operation.

10(b) Agency Findings. VDH ODW reviewed the project and determined that there are no apparent impacts to public drinking water sources due to this project.

11. Chesapeake Bay Preservation Areas. The FCD (page 15) states that the project is not located within Chesapeake Bay Preservation Areas or Atlantic Protection Areas in Accomack County.

11(a) Agency Jurisdiction. The policy is intended to protect and improve the water quality of the Chesapeake Bay, its tributaries, and other state waters by ensuring that land use and development performance criteria and standards are implemented in Chesapeake Bay Preservation Areas, which if improperly used or developed may result in substantial damage to the water quality of the Chesapeake Bay and its tributaries. The program is administered by DEQ and 84 Bay Act localities through the Chesapeake Bay Preservation Act (*Virginia Code §§ 28.2-104.1, 62.1-44.15:24, -44.15:51, -44.15:67, -44.15:68, -44.15:69, -44.15:73, -44.15:74, and -44.15:78*) and Chesapeake Bay Preservation Area Designation and Management Regulations (*9 VAC §§ 25-830-30, -40, -80, -90, -100, -120, -130, -140, and -150*).

11(b) Agency Findings. The DEQ Office of Local Governmental Assistance Programs reviewed the Environmental Assessment / Federal Consistency Determination submittal for the proposed project and determined that the proposed project is located outside of the Chesapeake Bay watershed and therefore not subject to the *Chesapeake Bay Preservation Area Designation and Management Regulations.*

11(c) CZMA Federal Consistency. The Chesapeake Bay Preservation Areas enforceable policy of the Virginia CZM Program does not apply to this project (see Federal Consistency under the CZMA section above (page 2) for additional information).

12. Non-point Source Water Pollution. The draft EA states (page 3-22) 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. Additionally, 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.

The FCD (page 21) states that the project will involve more than 10,000 square feet of land disturbance. The construction contractor would be required to prepare and implement an Erosion and Sediment Control Plan in accordance with the Virginia Erosion and Sediment Control Regulations (9 VAC 25-840-40). Because the project would disturb more than 1 acre, the construction contractor would also obtain coverage under Virginia's General Permit for Discharges of Stormwater from Construction Activities (9 VAC 25-260-50).

12(a) Agency Jurisdiction. The policy addresses the control stormwater runoff to protect the quality and quantity of state waters from the potential harm of unmanaged stormwater. Virginia's Erosion and Sediment Control Law requires soil-disturbing projects to be designed to reduce soil erosion and to decrease inputs of chemical nutrients and sediments to the Chesapeake Bay, its tributaries, and other rivers and waters of the Commonwealth. This program is administered by DEQ (*Virginia Code §§ 62.1-44.15:25, 62.1-44.15:52; 9 VAC §§ 25-840-30, 25-870-20*).

12(b) Requirements.

12(b)(i) Erosion and Sediment Control and Stormwater Management Plans. NASA and its authorized agents conducting regulated land-disturbing activities on private and public lands in the state must comply with *Virginia Erosion and Sediment Control Law and Regulations* (VESCL&R) and *Virginia Stormwater Management Law and Regulations* (VSWML&R), including coverage under the general permit for stormwater discharge from construction activities, and other applicable federal nonpoint source pollution mandates (e.g. Clean Water Act-Section 313, federal consistency under the Coastal Zone Management Act). Clearing and grading activities, installation of staging areas, parking lots, roads, buildings, utilities, borrow areas, soil stockpiles, and related land-disturbing activities that result in the total land disturbance of equal to or greater than 10,000 square feet would be regulated by VESCL&R. Accordingly, the Applicant must prepare and implement an erosion and sediment control (ESC) plan to ensure compliance with state law and regulations. Land-disturbing activities that result in the total land disturbance of equal to or greater than 1 acre would be regulated by VSWML&R. Accordingly, NASA must prepare and implement a Stormwater Management (SWM) plan to ensure compliance with state law and regulations. The ESC/SWM plan is submitted to the DEQ Regional Office that serves the area where the project is located for review for compliance. NASA is ultimately responsible for achieving project compliance through oversight of on-site contractors, regular field inspection, prompt action against non-compliant sites, and other mechanisms consistent with agency policy.

12(b)(ii) General Permit for Stormwater Discharges from Construction Activities (VAR10). The operator or owner of construction activities involving land-disturbing activities equal to or greater than 1 acre are required to register for coverage under the General Permit for Discharges of Stormwater from Construction Activities and develop a project-specific stormwater pollution prevention plan (SWPPP). The SWPPP must be prepared prior to submission of the registration statement for coverage under the general permit and address water quality and quantity in accordance with the VSMP Permit Regulations. General information and registration forms for the general permit are available on DEQ's website at https://www.deq.virginia.gov/water/stormwater.

DEQ is the review authority for state and federal plan review and approval, within the Tidewater Region, to coincide with permit application processing.

12(c) CZMA Federal Consistency. Provided the project adheres to the above requirements for erosion and sediment control and stormwater management, as applicable, it will be consistent to the maximum extent practicable with the Non-point Source Water Pollution enforceable policy of the Virginia CZM Program (see Federal Consistency under the CZMA section above (page 2) for additional information).

13. Historic Resources. The draft EA (page 3-110) states that the results of a V-CRIS search did not indicate the presence of known archaeological resources within the proposed project Area of Potential Effect (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. Section 106 coordination with the State Historic Preservation Officer will be completed.

13(a) Agency Jurisdiction. The Virginia Department of Historic Resources (DHR) conducts reviews of both federal and state projects to determine their effect on historic properties. Under the federal process, DHR is the State Historic Preservation Office, and ensures that federal undertakings - including licenses, permits, or funding - comply with Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulation at 36 CFR Part 800. Section 106 requires federal agencies to consider the effects of federal projects on properties that are listed or eligible for listing on the National Register of Historic Places. Please see DHR's website for more information about applicable state and federal laws and how to submit an application for review: http://www.dhr.virginia.gov/StateStewardship/Index.htm.

13(b) Agency Finding. NASA previously consulted with DHR on this undertaking pursuant to Section 106 of the National Historic Preservation Act, as amended, and its implementing regulation 36 CFR Part 800. DHR concurred that the undertaking will have no effect on historic properties listed in or eligible for listing in the National Register of Historic Places or the Virginia Landmarks Register. The DHR reiterates this determination.

14. Aviation. The draft EA (page 3-95) states 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. The report does not indicate that general aviation will be affected.

14(a) Agency Jurisdiction. The Virginia Department of Aviation is a state agency that plans for the development of the state aviation system; promotes aviation; grants aircraft and airports licenses; and provides financial and technical assistance to cities, towns, counties and other governmental subdivisions for the planning, development, construction and operation of airports, and other aviation facilities.

14(b) Agency Findings. The Virginia Department of Aviation has reviewed the documents provided. The Department believes that, as presented, the development should not present any significant impacts to aviation, given the existing operations at this facility.

REGULATORY AND COORDINATION NEEDS

1. Surface Waters and Wetlands. Contact VMRC (Randy Owen, 757-247-2251) with questions regarding the required wetlands board permit for impacts to tidal wetlands for this project.

2. Subaqueous Lands. Coordinate with VMRC (Randy Owen, 757-247-2251) regarding the condition that the dredged state-owned bottomlands must be beneficially reused in order for the project to be consistent with the Subaqueous Lands Enforceable Policy of the Virginia CZM Program.

Coordinate with VIMS (Emily Hein, 804-684-7482) with questions regarding its recommendations related to the dredging activities.

3. Air Pollution. Activities associated with this project may be subject to air regulations administered by DEQ. The state air pollution regulations that may apply to the project are:

- fugitive dust and emissions control (9VAC5-50-60 *et seq*.);
- open burning (9VAC5-130 *et seq*.);
- asphalt paving operations (9VAC5-45-760 *et seq*.); and
- permits for fuel-burning equipment (9VAC5-80-1100 *et seq*.).

For more information, questions, and coordination related to air pollution control requirements, contact DEQ TRO, John Brandt (757-407-2341).

4. Solid and Hazardous Wastes. All solid waste, hazardous waste, and hazardous materials must be managed in accordance with all applicable federal, state, and local environmental regulations. For additional information concerning location and availability of suitable waste management facilities in the project area contact DEQ TRO, Sean Priest at (757) 518-2141.

Contact Melinda Woodruff at (757) 518-2174 if free product, discolored soils, evidence of petroleum releases, or other evidence of contaminated soils are encountered. Documentation and / or questions related to ASTs/USTs should be submitted to TRO Tanks tro.tanks@deq.virginia.gov.

5. Natural Heritage Resources. Contact Anne Chazal, Natural Heritage Chief Biologist, at anne.chazal@dcr.virginia.gov or 804-786-9014 to discuss availability and rates for field work related to the recommended surveying for occurrences of A Eupatorium within the project site.

Contact DCR-DNH, Rene Hypes at (804) 371-2708, to secure updated information on natural heritage resources if the scope of the project changes and/or six months has passed before the project is implemented, since new and updated information is continually added to the Biotics Data System.

6. Floodplain Management. NASA is encouraged reach out to the local floodplain administrator and comply with the community's local floodplain ordinance. To find flood zone information, use the Virginia Flood Risk Information System (VFRIS): www.dcr.virginia.gov/vfris. To find community NFIP participation and local floodplain administrator contact information, use DCR's Local Floodplain Management Directory: www.dcr.virginia.gov/dam-safety-and-floodplains/floodplain-directory.

7. Wildlife and Inland Fisheries. Contact Amy Martin (804-367-2211) with questions related to the necessary information that is required in order for the project to comply with the Wildlife and Inland Fisheries Enforceable Policy of the Virginia CZM Program. NASA must make updates to Table 4-1 *Summary of BMPs, Mitigation, and Monitoring Measures* to clearly state which time of year restrictions will be adhered to and what specific minimization methods will be employed during construction to avoid and minimize impacts upon wildlife and their habitats. Alternatively, NASA may coordinate with DWR to make a commitment to adhere to DWR's recommendations and/or those offered by the National Oceanic and Atmospheric Administration (NOAA) or the U.S. Fish and Wildlife Service (USFWS).

Coordinate with DWR's Eastern Shore Biologist, Ruth Boettcher (Ruth Boattcher@dwr.virginia.gov, 757-709-0766) to discuss the beneficial use of the dredged materials.

8. Marine Fisheries. Coordinate with VMRC (Randy Owen, 757-247-2251) regarding the turbidity mitigation plan and surveyed channel designs including buffer areas adjacent to shellfish leases which are required for consistency with the Marine Fisheries Enforceable Policy of the Virginia CZM Program.

9. Dunes and Beaches. Coordinate with VMRC (Randy Owen, 757-247-2251) and VIMS (Emily Hein, 804-684-7482) regarding the strongly recommended beneficial reuse of dredged materials for beach nourishment.

10. Non-Point Source Water Pollution.

10(a) Erosion and Sediment Control and Stormwater Management. This project must comply with Virginia's *Erosion and Sediment Control Law* (Virginia Code § 62.1-44.15:61) and *Regulations* (9 VAC 25-840-30 *et seq*.) and *Stormwater Management Law* (Virginia Code § 62.1-44.15:31) and *Regulations* (9 VAC 25-870-210 *et seq*.) as administered by DEQ. Contact DEQ TRO (Courtney Smith, Courtney.Smith@deq.virginia.gov) with questions.

10(b) Virginia Stormwater Management Program General Permit for Stormwater Discharges from Construction Activities (VAR10). For projects involving land-disturbing activities of equal to or greater than one acre the project owner is required to register for coverage under the Virginia Stormwater Management Program General Permit for Discharges of Stormwater from Construction Activities (9 VAC 25-870-1 *et seq.*). Specific questions regarding the Stormwater Management Program requirements should be directed to Contact DEQ TRO (Courtney Smith, Courtney.Smith@deq.virginia.gov) with questions.

Thank you for the opportunity to review and respond to the Draft EA and Federal Consistency Determination for the Wallops Flight Facility Wallops Island Northern Development project. Detailed comments of reviewing agencies are attached for your review. Please contact me at (804) 659-1915 or Janine Howard at (804) 659-1916 for clarification of these comments.

Sincerely,

Bette Rayfield

Bettina Rayfield, Program Manager
Environmental Impact Review

Ec: Amy Martin, DWR
Keith Tignor, VDACS
Robbie Rhur, DCR
Arlene Warren, VDH
Roger Kirchen, DHR
Randy Owen, VMRC
Claire Gorman, VMRC

Emily Hein, VIMS
Heather Williams, VDOT
Rusty Harrington, DOAV
Elaine Meil, Accomack-Northampton Planning District Commission
Michael T. Mason, Accomack County

DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR PROGRAM COORDINATION

ENVIRONMENTAL REVIEW COMMENTS APPLICABLE TO AIR QUALITY

TO: Janine Howard

We thank **OEIR** for providing DEQ-AIR an opportunity to review the following project:

Document Type: Environmental Assessment/Federal Consistency Determination
Project Sponsor: National Aeronautics and Space Administration
Project Title: Wallops Flight Facility Wallops Island Northern Development Project
Location: Accomack County
Project Number: DEQ #21-164F

Accordingly, I am providing following comments for consideration.

PROJECT LOCATION: X **OZONE NON ATTAINMENT AND EMISSION CONTROL AREA FOR NOX & VOC**

REGULATORY REQUIREMENTSMAY BE APPLICABLE TO:
X **CONSTRUCTION**
☐ OPERATION

STATE AIR POLLUTION CONTROL BOARD REGULATIONS THAT MAY APPLY:

1. ☐ 9 VAC 5-40-5200 C & 9 VAC 5-40-5220 E – STAGE I
2. ☐ 9 VAC 5-45-760 et seq. – Asphalt Paving operations
3. **X 9 VAC 5-130 et seq. – Open Burning**
4. **X 9 VAC 5-50-60 et seq. Fugitive Dust Emissions**
5. ☐ 9 VAC 5-50-130 et seq. - Odorous Emissions; Applicable to____________________
6. ☐ 9 VAC 5-60-300 et seq. – Standards of Performance for Toxic Pollutants
7. ☐ 9 VAC 5-50-400 Subpart_____, Standards of Performance for New Stationary Sources, designates standards of performance for the______________________________
8. ☐ 9 VAC 5-80-1100 et seq. of the regulations – Permits for Stationary Sources
9. ☐ 9 VAC 5-80-1605 et seq. Of the regulations – Major or Modified Sources located in PSD areas. This rule may be applicable to the ______________________________
10. ☐ 9 VAC 5-80-2000 et seq. of the regulations – New and modified sources located in non-attainment areas
11. ☐ 9 VAC 5-80-800 et seq. Of the regulations – State Operating Permits. This rule may be applicable to ____

COMMENTS SPECIFIC TO THE PROJECT:

All precautions are necessary to restrict the emissions of volatile organic compounds (VOC) and oxides of nitrogen (NO_X).

K. S. Narasimhan

(Kotur S. Narasimhan)
Office of Air Data Analysis

DATE: December 17, 2021

Ann Jennings
Secretary of Natural and Historic Resources and Chief Resilience Officer

Clyde E. Cristman
Director

COMMONWEALTH of VIRGINIA
DEPARTMENT OF CONSERVATION AND RECREATION

MEMORANDUM

DATE: January 14, 2022

TO: Janine Howard, DEQ

FROM: Roberta Rhur, Environmental Impact Review Coordinator

SUBJECT: DEQ 21-164F, Wallops Flight Facility, Wallops Island Northern Development

Division of Natural Heritage

The Department of Conservation and Recreation's Division of Natural Heritage (DCR) has searched its Biotics Data System for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

According to the information currently in our files, the Wallops – Assawoman Islands Conservation Site is located within the project site. Conservation sites are tools for representing key areas of the landscape that warrant further review for possible conservation action because of the natural heritage resources and habitat they support. Conservation sites are polygons built around one or more rare plant, animal, or natural community designed to include the element and, where possible, its associated habitat, and buffer or other adjacent land thought necessary for the element's conservation. Conservation sites are given a biodiversity significance ranking based on the rarity, quality, and number of element occurrences they contain; on a scale of 1-5, 1 being most significant. Wallops – Assawoman Islands Conservation Site has been given a biodiversity significance ranking of B2, which represents a site of very high significance. The natural heritage resources of concern at this site are:

Eupatorium maritimum	A Eupatorium	G2?/S1?/SOC/NL
	Black Cherry Xeric Dune Woodland	G1G2/S1/NL/NL

A Eupatorium is a rare plant that occurs in interdunal swales in coastal Virginia and the Outer Banks region of North Carolina and resembles *Eupatorium mohrii* and *E. anomalum*, but distinguished from the former by broader leaves and taller stature, and from both by the shortly petiolate leaves, the tuberous rhizomes often pinkish in color, rather than whitish or tan, and some heads with more than five flowers. This species is known only from coastal Virginia and the Outer Banks of North Carolina. Its interdunal swale habitat is fairly restricted, and it is threatened by human development (Schilling and Grubbs 2016).

The Maritime Dune Woodland is a tall, deciduous, maritime shrubland or scrub forest of the mid-Atlantic coast, although physiognomy can vary dramatically, ranging from open woodland to stunted forest to dense nearly impenetrable thicket. Individual trees tend to be wind-pruned and multi-stemmed. It generally occurs on the lee side of sand dunes along the coast and is subject to salt spray and winds. The substrate varies from pure sand directly adjacent to the ocean to loamy sands in more sheltered areas of the coast. At the southern end of the range in Virginia, this community occurs as a woodland variably dominated by *Prunus serotina, Sassafras albidum, Diospyros virginiana*, and *Malus angustifolia var. angustifolia*. Vine tangles are patchy and interspersed with areas of open sand dominated by *Schizachyrium littorale* and also containing *Opuntia humifusa, Conyza canadensis, Nuttallanthus canadensis, Cirsium horridulum var. horridulum*, and other xerophytic herbs at lower cover. This maritime shrubland community is restricted to a narrow range on coastal dunes of barrier islands on the mid-Atlantic coast. It does not occur north of southern New Jersey or south of Virginia. Occurrences are naturally small (a few acres), confined to the oceanward portion of barrier islands. Potential or historic habitat has been reduced by extensive human development such as residential or commercial building, recreation, or road expansion.

As stated on page 3-39 of the "*Draft Wallops Island Northern Development Environmental Assessment*" dated December 2021, the Black Cherry Xeric Dune Woodland significant natural community would be impacted by the permanent removal of approximately 0.59 acre of woodland for the proposed construction of Hangar 2. DCR recommends limiting impacts to the Black Cherry Xeric Dune Woodland significant natural community to the greatest extent possible. Due to the documented occurrence of A Eupatorium within the project area and the potential for additional occurrences of A Eupatorium to occur within the project site, DCR recommends an inventory for the resource in the runway margins and also recommends surveying the known occurrence at the east end of the existing runway to determine the current extent of the population.

DCR-Division of Natural Heritage biologists are qualified to conduct inventories for rare, threatened, and endangered species. Please contact Anne Chazal, Natural Heritage Chief Biologist, at anne.chazal@dcr.virginia.gov or 804-786-9014 to discuss availability and rates for field work.

There are no State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

New and updated information is continually added to Biotics. Please re-submit project information and map for an update on this natural heritage information if the scope of the project changes and/or six months has passed before it is utilized.

The Virginia Department of Wildlife Resources (VDWR) maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters that may contain information not documented in this letter. Their database may be accessed from http://vafwis.org/fwis/ or contact Amy Martin at (804-367-2211) or amy.martin@dwr.virginia.gov. A documented occurrence of a state listed animal is located within the submitted project boundary including a 100-foot buffer. Therefore, DCR recommends coordination with the VDWR, Virginia's regulatory authority for the management and protection of this species to ensure compliance with the Virginia Endangered Species Act (VA ST §§ 29.1-563 – 570).

Division of Dam Safety and Floodplain Management

Floodplain Management Program:

The National Flood Insurance Program (NFIP) is administered by the Federal Emergency Management Agency (FEMA), and communities who elect to participate in this voluntary program manage and enforce the program on the local level through that community's local floodplain ordinance. Each local floodplain ordinance must comply with the minimum standards of the NFIP, outlined in 44 CFR 60.3; however, local communities may adopt more restrictive requirements in their local floodplain ordinance, such as regulating the 0.2% annual chance flood zone (Shaded X Zone).

All development within a Special Flood Hazard Area (SFHA), as shown on the locality's Flood Insurance Rate Map (FIRM), must be permitted and comply with the requirements of the local floodplain ordinance.

State Agency Projects Only

Executive Order 45, signed by Governor Northam and effective on November 15, 2019, establishes mandatory standards for development of state-owned properties in Flood-Prone Areas, which include Special Flood Hazard Areas, Shaded X Zones, and the Sea Level Rise Inundation Area. These standards shall apply to all state agencies.

1. Development in Special Flood Hazard Areas and Shaded X Zones
   - A. All development, including buildings, on state-owned property shall comply with the locally-adopted floodplain management ordinance of the community in which the state-owned property is located and any flood-related standards identified in the Virginia Uniform Statewide Building Code.
   - B. If any state-owned property is located in a community that does not participate in the NFIP, all development, including buildings, on such state-owned property shall comply with the NFIP requirements as defined in 44 CFR §§ 60.3, 60.4, and 60.5 and any flood-related standards identified in the Virginia Uniform Statewide Building Code.
     - (1) These projects shall be submitted to the Department of General Services (DGS), for review and approval.
     - (2) DGS shall not approve any project until the State NFIP Coordinator has reviewed and approved the application for NFIP compliance.
     - (3) DGS shall provide a written determination on project requests to the applicant and the State NFIP Coordinator. The State NFIP Coordinator shall maintain all documentation associated with the project in perpetuity.
   - C. No new state-owned buildings, or buildings constructed on state-owned property, shall be constructed, reconstructed, purchased, or acquired by the Commonwealth within a Special Flood Hazard Area or Shaded X Zone in any community unless a variance is granted by the Director of DGS, as outlined in this Order.

The following definitions are from Executive Order 45:

Development for NFIP purposes is defined in 44 CFR § 59.1 as "Any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials."

The Special Flood Hazard Area may also be referred to as the 1% annual chance floodplain or the 100-year floodplain, as identified on the effective Flood Insurance Rate Map and Flood Insurance Study. This includes the following flood zones: A, AO, AH, AE, A99, AR, AR/AE, AR/AO, AR/AH, AR/A, VO, VE, or V.

The Shaded X Zone may also be referred to as the 0.2% annual chance floodplain or the 500- year floodplain, as identified on the effective Flood Insurance Rate Map and Flood Insurance Study.

The Sea Level Rise Inundation Area referenced in this Order shall be mapped based on the National Oceanic and Atmospheric Administration Intermediate-High scenario curve for 2100, last updated in 2017, and is intended to denote the maximum inland boundary of anticipated sea level rise.

"State agency" shall mean all entities in the executive branch, including agencies, offices, authorities, commissions, departments, and all institutions of higher education.

"Reconstructed" means a building that has been substantially damaged or substantially improved, as defined by the NFIP and the Virginia Uniform Statewide Building Code.

Federal Agency Projects Only
Projects conducted by federal agencies within the SFHA must comply with federal Executive Order 11988: Floodplain Management.

DCR's Floodplain Management Program does not have regulatory authority for projects in the SFHA. The applicant/developer must contact the local floodplain administrator for an official floodplain determination and comply with the community's local floodplain ordinance, including receiving a local permit. Failure to comply with the local floodplain ordinance could result in enforcement action from the locality. For state projects, DCR recommends that compliance documentation be provided prior to the project being funded. For federal projects, the applicant/developer is encouraged reach out to the local floodplain administrator and comply with the community's local floodplain ordinance.

To find flood zone information, use the Virginia Flood Risk Information System (VFRIS): www.dcr.virginia.gov/vfris

To find community NFIP participation and local floodplain administrator contact information, use DCR's Local Floodplain Management Directory: www.dcr.virginia.gov/dam-safety-and-floodplains/floodplain-directory

The remaining DCR divisions have no comments regarding the scope of this project. Thank you for the opportunity to comment.

CC: Troy Andersen, USFWS
Amy Martin, VDWR

Literature Cited

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: August 9, 2010).

Schilling, E.E. and K.C. Grubbs. 2016. Systematics of the *Eupatorium mohrii* Complex (Asteraceae). Systematic Botany 41(3): 9 pp.

Commonwealth of Virginia

Howard, Janine <janine.howard@deq.virginia.gov>

NASA Wallops Flight Facility (WFF) – Wallops Island Northern Development (WIND)--DHR #2021-4540/DEQ #21-164F

1 message

Holma, Marc <marc.holma@dhr.virginia.gov> Wed, Dec 22, 2021 at 10:33 AM
To: "Howard, Janine" <janine.howard@deq.virginia.gov>

Janine,

Please accept this email as DHR's official response to DEQ's request for our review and comment on the above referenced project. NASA previously consulted with DHR on this undertaking pursuant to Section 106 of the National Historic Preservation Act, as amended, and its implementing regulation 36 CFR Part 800. We concurred that the undertaking will have no effect on historic properties listed in or eligible for listing in the National Register of Historic Places or the Virginia Landmarks Register. The DHR reiterates this determination.

Sincerely,
Marc

--
Marc Holma
Architectural Historian
Division of Review and Compliance
(804) 482-6090
marc.holma@dhr.virginia.gov

Commonwealth of Virginia

Howard, Janine <janine.howard@deq.virginia.gov>

Re: NEW PROJECT NASA Wallops Island Northern Development Project, DEQ 21-164F

1 message

Rusty Harrington <rusty.harrington@doav.virginia.gov> Tue, Jan 25, 2022 at 12:50 PM
To: "Howard, Janine" <janine.howard@deq.virginia.gov>

Good a. ernoon, Janine,

Thank you for reques ng our comments regarding the Federal Consistency Determina on for Wallops Flight Facility Wallops Island Northern Development Project, Project Number 21-164F.

The Virginia Department of Avia on has reviewed the documents provided. The Department believes that, as presented, the development should not present any significant impacts, given the exis ng opera ons at this facility.

The Department appreciates the considera on you have given to us by reques ng our comments on this project. Please do not hesitate to contact me should you have any ques ons or require further assistance regarding the Department's review of this project.

On Tue, Jan 25, 2022 at 11:15 AM Howard, Janine <janine.howard@deq.virginia.gov> wrote:

> Good Morning,
>
> As a reminder, if you have comments on this project please submit them ASAP.
>
> Thank you,
>
> *Janine Howard*
>
> Environmental Impact Review Coordinator
> Virginia Department of Environmental Quality
> 1111 East Main Street, Suite 1400
> Richmond, VA 23219
> *NEW PHONE NUMBER*: 804-659-1916
>
> For program updates and public notices please subscribe to Constant Contact.
>
> On Fri, Dec 17, 2021 at 2:25 PM Fulcher, Valerie <valerie.fulcher@deq.virginia.gov> wrote:
>
> > **Good a. ernoon - this is a new OEIR review request/project:**
> >
> > **Document Type: Environmental Assessment/Federal Consistency Determina on**
> > **Project Sponsor: Na onal Aeronau cs and Space Administra on**
> > **Project Title: Wallops Flight Facility Wallops Island Northern Development Project**
> > **Loca on: Accomack County**
> > **Project Number: DEQ #21-164F**
> >
> > **The document is available at https://public.deq.virginia.gov/OEIR/ in the NASA folder.**

Commonwealth of Virginia

Howard, Janine <janine.howard@deq.virginia.gov>

Re: ESSLog# 40924_21-164F_Wallops North End_DWR_AEM20220207

1 message

Martin, Amy <amy.martin@dwr.virginia.gov> Tue, Feb 15, 2022 at 2:55 PM
To: "Howard, Janine" <janine.howard@deq.virginia.gov>

Janine,
Thanks, that looks great!

Amy

Amy Martin
Manager
Wildlife Information and Environmental Services
she/her/hers
P 804.367.2211
Department of Wildlife Resources
CONSERVE. CONNECT. PROTECT.
A 7870 Villa Park Drive, P.O. Box 90778, Henrico, VA 23228
www.VirginiaWildlife.gov

On Tue, Feb 15, 2022 at 10:20 AM Howard, Janine <janine.howard@deq.virginia.gov> wrote:

Hi Amy,

Take a look at the below condition and let me know what you think. Feel free to make edits as you see fit. I've attached the enforceable policies for your reference.

- In accordance with the Threatened and Endangered Species section of the Wildlife and Inland Fisheries Enforceable Policy "No person shall harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, possess, collect, transport, sell or offer to sell, or attempt to do so, any species of fish or wildlife listed as threatened or endangered by the Board of Game and Inland Fisheries…" To comply with the policy NASA must make updates to Table 4.1 *Summary of BMPs, Mitigation, and Monitoring Measures* to clearly state which time of year restrictions will be adhered to and what specific minimization methods will be employed during construction to avoid and minimize impacts upon wildlife and their habitats. Alternatively, NASA may coordinate with DWR to make a commitment to adhere to DWR's recommendations and/or those offered by the National Oceanic and Atmospheric Administration (NOAA) or the U.S. Fish and Wildlife Service (USFWS). (*Va. Code Ann. §§ 29.1-501, -564, -566, -567, and -568; 4 Va. Admin. Code §§ 15-20-130 and – 140)*

Janine Howard

Environmental Impact Review Coordinator
Virginia Department of Environmental Quality
1111 East Main Street, Suite 1400
Richmond, VA 23219
NEW PHONE NUMBER: 804-659-1916

For program updates and public notices please subscribe to Constant Contact.

On Tue, Feb 8, 2022 at 8:38 AM Martin, Amy <amy.martin@dwr.virginia.gov> wrote:

Hi Janine,

Yes, a conditional concurrence would be ok. We just need something more than to assume they will adhere to our recommendations, like we would if we had seen permit applications for the project.

Thanks, Amy

Amy Martin
Manager
Wildlife Information and Environmental Services
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www.VirginiaWildlife.gov

On Tue, Feb 8, 2022 at 8:05 AM Howard, Janine <janine.howard@deq.virginia.gov> wrote:

Thank you Amy. I will share these comments with NASA and see if we get a response. If they don't provide the commitment you are asking for in a timely manner, how do you feel about a possible conditional concurrence based on the Wildlife and Inland Fisheries policy?

We are working with VMRC currently on conditional language based on the Subaqueous Lands and Marine Fisheries policy.

Thanks,

Janine Howard

Environmental Impact Review Coordinator
Virginia Department of Environmental Quality
1111 East Main Street, Suite 1400
Richmond, VA 23219
NEW PHONE NUMBER: 804-659-1916

For program updates and public notices please subscribe to Constant Contact.

On Mon, Feb 7, 2022 at 4:10 PM Martin, Amy <amy.martin@dwr.virginia.gov> wrote:

Janine,

We recently reviewed and provided comments on the Draft EA for the subject project and have now reviewed the federal consistency determination prepared for the activities proposed to develop the north end of Wallops Island. As indicated in our comments on the Draft EA, we have concerns for the protection of listed species potentially present within the work area. To avoid and minimize impacts upon such species, we recommended the following:

- A re-evaluation of potential impacts upon sea turtles based on information provided in the attached that these animals may remain in Virginia's waters through January.
- To best protect sea turtles, we recommend no hydraulic hopper dredging from April 1 through November 30 of any year and no work on suitable sea turtle nesting beaches from May 1 through November 15 or until the last nest hatches or is determined unviable by an approved nest searching crew.
- If hopper dredges are used to deepen the channel and turning basin, we recommend that onboard environmental/biological observers are present to monitor the potential entrainment (take) of sea turtles during dredging operations, irrespective of the time of year. Transport vessels that take up a large portion of the channel may also require an

onboard observer to alert the captain to the presence of sea turtles or marine mammals so that he/she can take measures to avoid a vessel strike.
- We recommend close coordination with us, the USFWS and NOAA Fisheries regarding the protection of sea turtles associated with all phases of this project and any future build out.
- We recommend that the location of any active Peregrine Falcon nests, to include the artificial nesting platform, be mapped and that no construction activities occur within 600 ft of the nest during the nesting season from February 15 through July 15 of any year.

As indicated in our comments on the EA, we are concerned about future development of Wallops Island and adjacent areas. These areas are known to support a number of listed species and are slowly being made unsuitable to these species because of continued expansion and shoreline stabilization activities at Wallops Flight Facility. Because the EA offers no information on how many vessels of what size will travel to and from the north end pier annually, it is difficult for us to determine what, if any, impacts upon marine animals and their habitats result from operation of the proposed facility. In addition, we are concerned that the port and operations area would become part of th**e** M-95 Marine Highway Corridor, allowing for transport of large space assets and related cargo via water vessel to the north end port. While we understand the value of this facility and the need to ensure it's security and capabilities, we must ensure that any impacts upon wildlife and their habitats, including threatened or endangered species, are fully considered, that all actions are taken to avoid and minimize impacts upon them, and that any unavoidable impacts are fully compensated.

We cannot make a determination of consistency until we have reviewed the Final EA for the project that includes updates to Table 4.1 *Summary of BMPs, Mitigation, and Monitoring Measures* to clearly state which time of year restrictions will be adhered to and what specific minimization methods will be employed during construction to avoid and minimize impacts upon wildlife and their habitats OR until we receive commitment from the applicant to adhere to the above recommendations and/or those offered by NOAA or the USFWS.

Thanks, Amy

Amy Martin
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www.VirginiaWildlife.gov

Commonwealth of Virginia

Howard, Janine <janine.howard@deq.virginia.gov>

ESSLog# 40924_21-164F_Wallops North End_DWR_AEM20220207

1 message

Martin, Amy <amy.martin@dwr.virginia.gov> Mon, Feb 7, 2022 at 4:09 PM
To: Janine Howard <janine.howard@deq.virginia.gov>
Cc: "Boettcher, Ruth" <ruth.boettcher@dwr.virginia.gov>

Janine,
We recently reviewed and provided comments on the Draft EA for the subject project and have now reviewed the federal consistency determination prepared for the activities proposed to develop the north end of Wallops Island. As indicated in our comments on the Draft EA, we have concerns for the protection of listed species potentially present within the work area. To avoid and minimize impacts upon such species, we recommended the following:

- A re-evaluation of potential impacts upon sea turtles based on information provided in the attached that these animals may remain in Virginia's waters through January.
- To best protect sea turtles, we recommend no hydraulic hopper dredging from April 1 through November 30 of any year and no work on suitable sea turtle nesting beaches from May 1 through November 15 or until the last nest hatches or is determined unviable by an approved nest searching crew.
- If hopper dredges are used to deepen the channel and turning basin, we recommend that onboard environmental/biological observers are present to monitor the potential entrainment (take) of sea turtles during dredging operations, irrespective of the time of year. Transport vessels that take up a large portion of the channel may also require an onboard observer to alert the captain to the presence of sea turtles or marine mammals so that he/she can take measures to avoid a vessel strike.
- We recommend close coordination with us, the USFWS and NOAA Fisheries regarding the protection of sea turtles associated with all phases of this project and any future build out.
- We recommend that the location of any active Peregrine Falcon nests, to include the artificial nesting platform, be mapped and that no construction activities occur within 600 ft of the nest during the nesting season from February 15 through July 15 of any year.

As indicated in our comments on the EA, we are concerned about future development of Wallops Island and adjacent areas. These areas are known to support a number of listed species and are slowly being made unsuitable to these species because of continued expansion and shoreline stabilization activities at Wallops Flight Facility. Because the EA offers no information on how many vessels of what size will travel to and from the north end pier annually, it is difficult for us to determine what, if any, impacts upon marine animals and their habitats result from operation of the proposed facility. In addition, we are concerned that the port and operations area would become part of the M-95 Marine Highway Corridor, allowing for transport of large space assets and related cargo via water vessel to the north end port. While we understand the value of this facility and the need to ensure it's security and capabilities, we must ensure that any impacts upon wildlife and their habitats, including threatened or endangered species, are fully considered, that all actions are taken to avoid and minimize impacts upon them, and that any unavoidable impacts are fully compensated.

We cannot make a determination of consistency until we have reviewed the Final EA for the project that includes updates to Table 4.1 *Summary of BMPs, Mitigation, and Monitoring Measures* to clearly state which time of year restrictions will be adhered to and what specific minimization methods will be employed during construction to avoid and minimize impacts upon wildlife and their habitats OR until we receive commitment from the applicant to adhere to the above recommendations and/or those offered by NOAA or the USFWS.

Thanks, Amy

Amy Martin

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Commonwealth of Virginia

Howard, Janine <janine.howard@deq.virginia.gov>

ESSLog# 40924_21-164F_Wallops North End Developments_DWR_AEM20220121

1 message

Martin, Amy <amy.martin@dwr.virginia.gov> Fri, Jan 21, 2022 at 5:41 PM
To: Janine Howard <janine.howard@deq.virginia.gov>
Cc: "Boettcher, Ruth" <ruth.boettcher@dwr.virginia.gov>

Janine,
We have reviewed the Environmental Assessment for proposed activities at the north end of Wallops Flight Facility in Accomack County. The proposed alternative, which is broken into 3 phases, includes development of an up to 1305 ft pier and turning basin along with the development of onshore infrastructure. We document federal Threatened Loggerhead Sea Turtles, federal Threatened Piping Plovers, state Threatened Peregrine Falcons, and state Threatened Gull-billed Terns from the project area. Depending on the habitat available on site these species may be present within proposed work areas, at least during certain times of year. It appears the listed species potentially present have been correctly captured in Table 3.9.1 *Federally and State Listed Species with Potential to Occur in the Project Area and Determination of Effects*. However, we note that table 3.7.1 *Terrestrial Wildlife Species with Potential to Occur in the Project Area and Table 3.9.1*is missing these species and others that may occur in the project area. We recommend that the applicant and/or their agents conduct a preliminary desktop analysis to evaluate potential impacts upon the Commonwealth's wildlife resources by accessing our online information system, the Virginia Fish and Wildlife Information Service (VAFWIS) and using the Geographic Search function to generate an Initial Project Assessment (IPA) report and use the species list generated to fill out this table. One may access VAFWIS at https://vafwis.DWR.virginia.gov/fwis/ . Alternatively, one may contact our Geographic Information Systems (GIS) Coordinator, Jay Kapalczynski, at Jay.Kapalczynski@DWR.virginia.gov to request access to the Wildlife Mapping and Environmental Review Map Service (WERMS) which allows one to download GIS data into your own system. Further, we recommend accessing information about the location of bat hibernacula and roosts and Bald Eagle nest locations from the following: Northern Long-Eared Bats: https://www.dwr.virginia.gov/wildlife/bats/northern-long-eared-bat-application/ ; Little Brown Bats and Tricolored Bats: https://www.dwr.virginia.gov/wildlife/bats/little-brown-bat-tri-colored-bat-winter-habitat-roosts-application/; and the Center for Conservation Biology's Eagle Nest Locator at https://ccbbirds.org/what-we-do/research/species-of-concern/virginia-eagles/nest-locator/ .

The EA states that sea turtles are only likely to be present in the Project Area from May through November of any year. While that may historically have been true, Virginia's coastal waters now remain warm enough long enough for sea turtles to still be present well into December and January. This is evidenced by the increasing numbers of cold-stunned turtle strandings reported by the Virginia Aquarium Stranding Response Program during these months. We recommend consideration of this information and a re-evaluation of potential impacts upon sea turtles in light of this information. We also recommend no hydraulic hopper dredging in the project area from April 1 through November 30 of any year. In addition, we recommend no work on suitable sea turtle nesting beaches from May 1 through November 15 or until the last nest hatches or is determined unviable by an approved nest searching crew. We recommend that environmental/biological monitors be present to support the avoidance of vessel strikes with sea turtles and/or other marine wildlife. We recommend close coordination with us, the USFWS and NOAA Fisheries regarding the protection of sea turtles associated with all phases of this project and any future build out.

We recommend that the location of any active Peregrine Falcon nests, to include the artificial nesting platform, be mapped and that no construction activities occur within 600 ft of the nest during the nesting season from February 15 through July 15 of any year.

It appears NASA proposes to place their dredged materials in the Open Ocean Dredge Material Placement Area, at least for initial dredging. We strongly recommend that NASA work with us and our conservation partners to find a beneficial use for that material and perhaps material surfaced by future dredging on site. NASA has, over the years as the result of many projects, adversely impacted shoreline and nearshore habitats. Using dredged materials to restore some of that impacted habitat or other similarly impacted habitats would be of great benefit to the region and the species that use these impacted habitats.

We recommend that NASA update Table 4.1 *Summary of BMPs, Mitigation, and Monitoring Measures* to indicate what time of year restrictions they will adhere to, what specific minimization methods will be employed during construction to avoid and minimize impacts upon wildlife and their habitats, and what types of vessel restrictions will be in place. Currently this table only speaks very generally to what mitigation measures may be in place.

We recommend conducting any in-stream activities during low or no-flow conditions, using non-erodible cofferdams or turbidity curtains to isolate the construction area, blocking no more than 50% of the streamflow at any given time (minimal overlap of construction footprint notwithstanding), stockpiling excavated material in a manner that prevents reentry into the stream, restoring original streambed and streambank contours, revegetating barren areas with native vegetation, and implementing strict erosion and sediment control measures. We recommend that instream work be designed and performed in a manner that minimizes impacts upon natural streamflow and movement of resident aquatic species. If a dam and pump-around must be used, we recommend it be used for as limited a time as possible and that water returned to the stream be free of sediment and excess turbidity. To minimize potential wildlife entanglements resulting from use of synthetic/plastic erosion and sediment control matting, we recommend use of matting made from natural/organic materials such as coir fiber, jute, and/or burlap. To minimize harm to the aquatic environment and its residents resulting from use of the Tremie method to install concrete, installation of grout bags, and traditional pouring of concrete, we recommend that such activities occur only in the dry, allowing all concrete to harden and cure prior to contact with open water. Due to future maintenance costs associated with culverts, and the loss of riparian and aquatic habitat, we prefer stream crossings to be constructed via clear-span bridges. However, if this is not possible, we recommend countersinking any culverts below the streambed at least 6 inches, or the use of bottomless culverts, to allow passage of aquatic organisms. We also recommend the installation of floodplain culverts to carry bankfull discharges.

To minimize overall impacts to wildlife and our natural resources, we offer the following comments about development activities: we recommend that the applicant avoid and minimize impacts to undisturbed forest, wetlands, and streams to the fullest extent practicable. Avoidance and minimization of impact may include relocating stream channels as opposed to filling or channelizing as well as using, and incorporating into the development plan, a natural stream channel design and forested riparian buffers. We recommend maintaining undisturbed naturally vegetated buffers of at least 100 feet in width around all on-site wetlands and on both sides of all perennial and intermittent streams. We recommend maintaining wooded lots to the fullest extent possible. We generally do not support proposals to mitigate wetland impacts through the construction of stormwater management ponds, nor do we support the creation of in-stream stormwater management ponds.

We recommend that the stormwater controls for this project be designed to replicate and maintain the hydrographic condition of the site prior to the change in landscape. This should include, but not be limited to, utilizing bioretention areas, and minimizing the use of curb and gutter in favor of grassed swales. Bioretention areas (also called rain gardens) and grass swales are components of Low Impact Development (LID). They are designed to capture stormwater runoff as close to the source as possible and allow it to slowly infiltrate into the surrounding soil. They benefit natural resources by filtering pollutants and decreasing downstream runoff volumes.

We recommend that all tree removal and ground clearing adhere to a time of year restriction (TOYR) protective of resident and migratory songbird nesting from March 15 through August 15 of any year.

We recommend adherence to erosion and sediment controls during ground disturbance. To minimize potential wildlife entanglements resulting from use of synthetic/plastic erosion and sediment control matting, we recommend use of matting made from natural/organic materials such as coir fiber, jute, and/or burlap.

Thanks, Amy

Amy Martin
Manager, Wildlife Information and Environmental Services

she/her/hers
P 804.367.2211
Department of Wildlife Resources
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VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

MEMORANDUM

TO: Janine Howard, DEQ/EIR Environmental Program Planner

FROM: Carlos A. Martinez, Division of Land Protection & Revitalization Review Coordinator

DATE: January 10, 2022

COPIES: Sanjay Thirunagari, Division of Land Protection & Revitalization Review Manager; file

SUBJECT: Environmental Impact Review: 22-164F Wallops Flight Facility Wallops Island Northern Development Project in Accomack County, Virginia.

The Division of Land Protection & Revitalization (DLPR) has completed its review of the National Aeronautics and Space Administration's December 17, 2021 EIR for Wallops Flight Facility Wallops Island Northern Development Project in Accomack County, Virginia.

DLPR staff conducted a search (200 ft. radius) of the project area of solid and hazardous waste databases (including petroleum releases) to identify waste sites in close proximity to the project area. DLPR identified one (1) RCRA Large Quantity Generator, one (1) RCRA Small Quantity Generator, one (1) VRP site, and twenty-six (26) petroleum release sites within the project area which might impact the project.

DLPR staff has reviewed the submittal and offers the following comments:

***Hazardous Waste/RCRA Facilities* – One (1) RCRA Large Quantity Generator and one (1) RCRA Small Quantity Generator in close proximity to the project area**

1. ***Registry ID: 110000607488, US NASA GSFC WALLOPS FLIGHT FACILITY, WALLOPS FLIGHT FACILITY, WALLOPS ISLAND, VA 23337.***

2. ***Registry ID: 110070828367, U.S. NASA GSFC WALLOPS FLIGHT FACILITY, 34200 FULTON STREET, WALLOPS FLIGHT FACILITY, WALLOPS ISLAND, VA 23337.***

***CERCLA Sites* – none in close proximity to the project area**

***Formerly Used Defense Sites (FUDS)* – none in close proximity to the project area.**

***Solid Waste* – none in close proximity to the project area**

***Virginia Remediation Program (VRP)* - One (1) VRP site in close proximity to the project area**

1. ***Site Number: VRP00662, NASA Wallops WFF Pad 0A, Wallops Island, Virginia, 23337. Primary Status: Certificate Issued. Secondary Status: Refer to Certificate Status.***

***Petroleum Releases* – Twenty-six (26) found in close proximity to the project area.**

1. ***PC Number 19992348, NASA Wallops Earth Station Runway 10-28, 34200 Fulton St, Wallops Island, Virginia, Release Date: 03/07/1999, Status: Closed.***

2. ***PC Number 19992209, NASA Wallops Flight Facility – NOAA Facility, 34200 Fulton St, Wallops Island, Virginia , Release Date: 07/20/1998, Status: Closed.***

3. ***PC Number 19992282, NASA Wallops Flight Facility – Satan Radar Antenna, 34200 Fulton St, Wallops Island, Virginia, Release Date: 11/16/1998, Status: Closed.***

4. ***PC Number 20165134, NASA WFF – Pipeline and Jet Fuel Receiving Area, 34200 Fulton St, Wallops Island, Virginia, Release Date: 01/06/2016, Status: Closed.***

5. ***PC Number 19920576, NASA Wallops Flight Facility – Visitor Center, 34200 Fulton St, Wallops Island, Virginia, Release Date: 10/01/1991, Status: Closed.***

6. ***PC Number 19921558, NASA Wallops Flight Facility – Bldg M-1, 34200 Fulton St, Wallops Island, Virginia, Release Date: 03/05/1992, Status: Closed.***

7. ***PC Number 19910470, NASA Wallops Flight Facility – Control Tower, 34200 Fulton St, Wallops Island, Virginia , Release Date: 09/23/1990, Status: Closed.***

8. ***PC Number 19920783, NASA Wallops Flight Facility – Bldg D-1, 34200 Fulton St, Wallops Island, Virginia, Release Date: 10/28/1991, Status: Closed.***

9. ***PC Number 20155141, Former Navy A-7 Auxiliary Power Station, 34200 Fulton St, Wallops Island, Virginia, Release Date: 01/11/2015, Status: Closed.***

10. ***PC Number 19962241, NASA Wallops Flight Facility – New Fuel Farm, 34200 Fulton St, Wallops Island, Virginia, Release Date: 09/17/1995, Status: Closed.***

11. ***PC Number 19931193, NASA Wallops Flight Facility – NOAA, 34200 Fulton St, Wallops Island, Virginia, Release Date: 12/16/1992, Status: Closed.***

12. ***PC Number 19930400, NASA Wallops Flight Facility D-102/103, 34200 Fulton St, Wallops Island, Virginia, Release Date: 02/17/1992, Status: Closed.***

13. ***PC Number 19922027, NASA Wallops Flight Facility – Site D8, 34200 Fulton St, Wallops Island, Virginia, Release Date: 04/30/1992, Status: Closed.***

14. ***PC Number 19900039, NASA Wallops Flight Facility – Old Aviation Fuel Farm, 34200 Fulton St, Wallops Island, Virginia , Release Date: 07/10/1989, Status: Open.***

15. ***PC Number 19910580, NASA Wallops Flight Facility – Bldg Y-30, 34200 Fulton St, Wallops Island, Virginia, Release Date: 07/08/1990, Status: Closed.***

16. ***PC Number 20015022, NASA Wallops Flight Facility – AST 448, 34200 Fulton St, Wallops Island, Virginia, Release Date: 08/30/2000, Status: Closed.***

17. ***PC Number 19922008, NASA Wallops Flight Facility – Site U-30, 34200 Fulton St, Wallops Island, Virginia, Release Date: 06/01/1992, Status: Closed.***

18. ***PC Number 19952405, NASA Wallops Flight Facility – Bldg V10, 34200 Fulton St, Wallops Island, Virginia, Release Date: 05/02/1995, Status: Closed.***

19. ***PC Number 20005119, NASA Wallops Flight Facility – Bldg X-76, 34200 Fulton St, Wallops Island, Virginia, Release Date: 10/25/1999, Status: Closed.***

20. ***PC Number 19922026, NASA Wallops Flight Facility – Bldg X-75, 34200 Fulton St, Wallops Island, Virginia, Release Date: 06/01/1992, Status: Closed.***

21. ***PC Number 19930913, NASA Wallops Flight Facility – Bldgs X-5 & X-15, 34200 Fulton St, Wallops Island, Virginia, Release Date: 11/03/1992, Status: Closed.***

22. ***PC Number 20085052, NASA Wallops Flight Facility – Power Plant-Site 5,12, 34200 Fulton St, Wallops Island, Virginia, Release Date: 12/03/2007, Status: Closed.***

23. ***PC Number 20015044, NASA Wallops Flight Facility – Bldg X-5, Island Facility, Accomack, Virginia, Release Date: 10/17/2000, Status: Closed.***

24. ***PC Number 19910363, NASA Wallops Flight Facility – Bldg Y-40, 34200 Fulton St, Wallops Island, Virginia, Release Date: 09/10/1990, Status: Closed.***

25. ***PC Number 199100396, Z-65 & Y305, 34200 Fulton St, Wallops Island, Virginia, Release Date: 07/08/1990, Status: Closed.***

26. ***PC Number 20135070, MARS - Wallops Island – Pad 0-A – Hurricane Sandy, Island Facility, Accomack, Virginia, Release Date: 01/13/2013, Status: Closed.***

Please note that the DEQ's Pollution Complaint (PC) cases identified should be further evaluated by the project engineer or manager to establish the exact location, nature and extent of the petroleum release and the potential to impact the proposed project. In addition, the project engineer or manager should contact the DEQ's Tidewater Regional Office at (757) 518-2000 (Tanks Program) for further information about the PC cases.

PROJECT SPECIFIC COMMENTS

None

GENERAL COMMENTS

Soil, Sediment, Groundwater, and Waste Management

Any soil, sediment or groundwater that is suspected of contamination or wastes that are generated must be tested and disposed of in accordance with applicable Federal, State, and local laws and regulations. Some of the applicable state laws and regulations are: Virginia Waste Management Act, Code of Virginia Section 10.1-1400 *et seq.*; Virginia Hazardous Waste Management Regulations (VHWMR) (9VAC 20-60); Virginia Solid Waste Management Regulations (VSWMR) (9VAC 20-81); Virginia Regulations for the Transportation of Hazardous Materials (9VAC 20-110). Some of the applicable Federal laws and regulations are: the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. Section 6901 *et seq.*, and the applicable regulations contained in Title 40 of the Code of Federal Regulations; and the U.S. Department of Transportation Rules for Transportation of Hazardous Materials, 49 CFR Part 107.

Asbestos and/or Lead-based Paint

All structures being demolished/renovated/removed should be checked for asbestos-containing materials (ACM) and lead-based paint (LBP) prior to demolition. If ACM or LBP are found, in addition to the federal waste-related regulations mentioned above, State regulations 9VAC 20-81-620 for ACM and 9VAC 20-60-261 for LBP must be followed. Questions may be directed to Melinda Woodruff at the DEQ's Tidewater Regional Office at (757) 518-2000.

Pollution Prevention – Reuse - Recycling

Please note that DEQ encourages all construction projects and facilities to implement pollution prevention principles, including the reduction, reuse, and recycling of all solid wastes generated. All generation of hazardous wastes should be minimized and handled appropriately.

If you have any questions or need further information, please contact Carlos A. Martinez by phone at (804) 698-4575 or email carlos.martinez@deq.virginia.gov.

Commonwealth of Virginia

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

1111 E. Main Street, Suite 1400, Richmond, Virginia 23219
P.O. Box 1105, Richmond, Virginia 23218
(800) 592-5482
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Ann F. Jennings
Secretary of Natural and Historic Resources

David K. Paylor
Director
(804) 698-4000

MEMORANDUM

TO: Janine Howard, DEQ Office of Environmental Impact Review

FROM: Amber Foster, DEQ Principal Environmental Planner

DATE: December 30, 2021

SUBJECT: DEQ #21-164F - Wallops Flight Facility Wallops Island Northern Development Project, Accomack County

We have reviewed the Environmental Assessment / Federal Consistency Determination submittal for the proposed project and offer the following comments regarding consistency with the provisions of the *Chesapeake Bay Preservation Area Designation and Management Regulations*.

The proposed project is located outside of the Chesapeake Bay watershed and therefore not subject to the *Chesapeake Bay Preservation Area Designation and Management Regulations.*

Commonwealth of Virginia

Howard, Janine <janine.howard@deq.virginia.gov>

Re: NEW PROJECT NASA Wallops Island Northern Development Project, DEQ 21-164F

1 message

Gavan, Lawrence <larry.gavan@deq.virginia.gov>
To: Janine Howard <janine.howard@deq.virginia.gov>

Mon, Dec 20, 2021 at 2:32 PM

(a) Agency Jurisdiction. The Department of Environmental Quality (DEQ) administers the *Virginia Erosion and Sediment Control Law and Regulations* (*VESCL&R*) and *Virginia Stormwater Management Law and Regulations* (*VSWML&R*).

(b) Erosion and Sediment Control and Stormwater Management Plans. The Applicant and its authorized agents conducting regulated land-disturbing activities on private and public lands in the state must comply with *VESCL&R* and *VSWML&R*, including coverage under the general permit for stormwater discharge from construction activities, and other applicable federal nonpoint source pollution mandates (e.g. Clean Water Act-Section 313, federal consistency under the Coastal Zone Management Act). Clearing and grading activities, installation of staging areas, parking lots, roads, buildings, utilities, borrow areas, soil stockpiles, and related land-disturbing activities that result in the total land disturbance of equal to or greater than 10,000 square feet (2,500 square feet in Chesapeake Bay Preservation Area) would be regulated by *VESCL&R*. Accordingly, the Applicant must prepare and implement an erosion and sediment control (ESC) plan to ensure compliance with state law and regulations. Land-disturbing activities that result in the total land disturbance of equal to or greater than 1 acre (2,500 square feet in Chesapeake Bay Preservation Area) would be regulated by *VSWML&R*. Accordingly, the Applicant must prepare and implement a Stormwater Management (SWM) plan to ensure compliance with state law and regulations. The Applicant is ultimately responsible for achieving project compliance through oversight of on-site contractors, regular field inspection, prompt action against non-compliant sites, and other mechanisms consistent with agency policy. [Reference: VESCL 62.1-44.15 et seq.]

(c) General Permit for Stormwater Discharges from Construction Activities (VAR10). DEQ is responsible for the issuance, denial, revocation, termination and enforcement of the Virginia Stormwater Management Program (VSMP) General Permit for Stormwater Discharges from Construction Activities related to municipal separate storm sewer systems (MS4s) and construction activities for the control of stormwater discharges from MS4s and land disturbing activities under the Virginia Stormwater Management Program.

The owner or operator of projects involving land-disturbing activities of equal to or greater than 1 acre is required to register for coverage under the General Permit for Discharges of Stormwater from Construction Activities and develop a project-specific Stormwater Pollution Prevention Plan. Construction activities requiring registration also include land disturbance of less than one acre of total land area that is part of a larger common plan of development or sale if the larger common plan of development will collectively disturb equal to or greater than one acre The SWPPP must be prepared prior to submission of the registration statement for coverage under the general permit and the SWPPP must address water quality and quantity in accordance with the *VSMP Permit Regulations*.
[Reference: Virginia Stormwater Management Act 62.1-44.15 et seq.; VSMP Permit Regulations *9*VAC25-880 *et seq.]*

Larry Gavan

DEPARTMENT OF ENVIRONMENTAL QUALITY
TIDEWATER REGIONAL OFFICE

Environmental Impact Review
Coordination Review

To: Office of Environmental Impact Review

From: Jeff Hannah, Regional VWPP Program Manager

Date: January 7, 2022

Project: NASA Wallops Island Northern Development Project, DEQ #21-164F

As requested, the DEQ Tidewater Regional Office has reviewed the supplied information and offers the following comments:

Air Compliance Program :
The following air regulations may be applicable: Virginia Administrative Code 9 VAC 5-50-60 *et seq*. which addresses the abatement of visible emissions and fugitive dust emissions, and Virginia Administrative Code 9 VAC 5-130-10 et *seq*. which addresses open burning. For additional information, contact John Brandt, DEQ-TRO at (757)407-2341.

Land Program (Solid and Hazardous Waste):
All construction and demolition waste, including any excess soil, must be characterized in accordance with the Virginia Hazardous Waste Management Regulations and disposed of at an appropriate facility as applicable.
For additional information, contact Melinda Woodruff, DEQ-TRO at melinda.woodruff@deq.virginia.gov .

Stormwater:
A construction general permit (CGP) is required prior to commencement of land disturbing activities greater than 1 acre for the discharge of sediment from construction activities. An approved Erosion and Sediment Control Plan (<1 acre of land disturbance) or an approved Stormwater Management Plan (>1 acre of land disturbance) is required prior to commencement of any land disturbing activities. In addition, DEQ is the review authority for state and federal plan review and approval, within the Tidewater Region, to coincide with permit application processing. For additional information, contact Courtney Smith, DEQ-TRO at (757)493-1072.

Virginia Water Protection Permit Program (VWPP):
Potential adverse impacts to water quality and wetlands resulting from surface runoff due to construction activities must be minimized. This can be achieved by using Best Management Practices (BMPs). Permanent or temporary impacts to surface waters and wetlands require DEQ authorization under §401 of the Clean Water Act, Virginia Code §62.1-44.15:20, and Virginia Administrative Code 9 VAC 25-210-10 *et seq*. Provided that any and all necessary permits are obtained and complied with, the project will be consistent with DEQ program requirements. For additional information, contact Jeff Hannah, DEQ-TRO at (757)407-2510.

Water Permit Program (VPDES):

No comments as there does not appear to be any point source discharges of process water or wastewater associated with this project that would necessitate a VPDES permit.

Petroleum Storage Tank Program:

DEQ records do not indicate any reported petroleum releases along the proposed project footprint. If evidence of a petroleum release is discovered during implementation of this project, it must be reported to DEQ, as authorized by CODE # 62.1-44.34.8 through 19 and 9 VAC 25-580-10 et seq. Contact Ms. Melinda Woodruff at (757)407-2516. Petroleum-contaminated soils and ground water generated during implementation of this project must be properly characterized and disposed of properly.

Installation and operation of any regulated petroleum storage tank(s) either AST or UST must also be conducted in accordance with the Virginia Regulations 9 VAC 25-91-10 et seq and / or 9 VAC 25-580-10 et seq. Documentation and / or questions should be submitted to TRO Tanks at Tidewater Regional Office – 5636 Southern Blvd., Virginia Beach, VA 23462. tro.tanks@deq.virginia.gov.

Based on the submitted information, it appears the proposed project will result in a *[Level of impact]* environmental impact.

Commonwealth of Virginia

Howard, Janine <janine.howard@deq.virginia.gov>

Re: NEW PROJECT NASA Wallops Island Northern Development Project, DEQ 21-164F

1 message

Warren, Arlene <arlene.warren@vdh.virginia.gov> Mon, Jan 10, 2022 at 10:36 AM
To: Janine Howard <janine.howard@deq.virginia.gov>
Cc: rr Environmental Impact Review <eir@deq.virginia.gov>

Project Name: Wallops Flight Facility Wallops Island Northern Development
Project #: 21-164 F
UPC #: N/A
Location: Accomack County

VDH – Office of Drinking Water has reviewed the above project. Below are our comments as they relate to proximity to **public drinking water sources** (groundwater wells, springs and surface water intakes). Potential impacts to public water distribution systems or sanitary sewage collection systems **must be verified by the local utility.**

There are no public groundwater wells within a 1-mile radius of the project site.

There are no surface water intakes located within a 5-mile radius of the project site.

The project is not within the watershed of any public surface water intakes.

There are no apparent impacts to public drinking water sources due to this project.

The Virginia Department of Health – Office of Drinking Water appreciates the opportunity to provide comments. If you have any questions, please let me know.

Best Regards,

Arlene Fields Warren

GIS Program Support Technician

Office of Drinking Water

Virginia Department of Health

109 Governor Street

Richmond, VA 23219

(804) 864-7781

On Fri, Dec 17, 2021 at 2:25 PM Fulcher, Valerie <valerie.fulcher@deq.virginia.gov> wrote:

> **Good afternoon - this is a new OEIR review request/project:**

27 January 2022

Ms. Janine Howard
Office of Environmental Impact Review
Dept. of Environmental Quality
P.O. Box 1105
Richmond, VA 23218

Dear Ms. Howard:

We have reviewed the Wallops Island Northern Development (WIND) Project Environmental Assessment (EA) submitted by the National Aeronautics and Space Administration (NASA) as part of the federal consistency determination (DEQ #21-164F). The portions of the project in the intertidal and subaqueous areas include dredging a channel and turning basins and constructing a new pier and ramp for the purpose of securing vessel access to the island for transporting spacecraft, equipment, and experiments and to allow vessels to dock for research, testing, and training. Scientists from the departments of Physical Sciences and Fisheries Science and the Office of Research and Advisory Services contributed to this review.

The proposed pier will be constructed during project phases one and two, with 624 feet constructed during the first phase, and an additional 676 feet in phase two. The pier will require a total of 400, 24-foot-square pre-stressed concrete piles that will be installed with an impact hammer. The project will permanently impact 2.33 acres of tidal wetlands and temporarily impact an additional 1.74 acres. We recommend monitoring and replanting plans be developed for the areas of temporary impacts to vegetated tidal wetlands to ensure their recovery following construction. A *Phragmites* control plan is already in place for Wallops Island and can be applied to the proposed project.

Dredging will occur during phases one and three, with the initial dredging of the channel and turning basin to nine feet below mean lower low water (MLLW). Phase three operations will extend the channel depth to 12 feet MLLW and dredge a new turning basin to coincide with the end of the extended pier (constructed during phase two). The total volume of dredged material is estimated to be 94,000 cubic yards and the geotechnical investigation indicates it is approximately 95% sand. The sandy material is anticipated to settle quickly, so we recommend use of a turbidity curtain around the dredging operations only when they are in close proximity to shellfish resources. If the use of turbidity curtains is not possible due to current velocities, we recommend consideration of dredging the during slack tides and the western portion of the channel during flood tide and the eastern portion of the channel during ebb tides. We further recommend consultation with the Virginia Marine Resources Commission's Shellfish Management Division for additional information regarding shellfish bed locations and mitigation strategies. We also recommend adherence to the standard dredge buffers of a minimum of twice the dredge cut from nonvegetated tidal wetlands and four times the dredge cut from vegetated tidal wetlands.

Dredging the new channel will provide an additional path for tidal exchange between Chincoteague Inlet and the marshes and lagoons landward of Wallops and Chincoteague islands. Consequently, the flow through Chincoteague Channel (federal channel authorized to 12 feet, maintained to 9 feet) will be reduced and the channel may therefore shoal and require more frequent maintenance dredging. Hydrodynamic modeling is required to estimate the extent of this potential shoaling. VIMS is the lead institution on the Commonwealth-funded *Chincoteague Inlet Modeling Study (CIMS)*, which is developing a wave, hydrodynamic, and multi-class sediment-transport numerical model of the Inlet and adjacent barrier islands, including the area to be impacted by the proposed NASA channel. Modeled scenarios incorporate the proposed dredging activities. We expect preliminary results within the next couple of months, and can share those findings with NASA and the regulatory community. The results of CIMS should provide information regarding the full impacts from this project and we recommend consideration of delaying action until these results are available.

The dredged material is proposed to be placed in the Wallops Open Ocean Disposal site primarily because it is the least expensive alternative of the five evaluated in the EA. However, the costs considered are only those related to dredging and placement of the sediment, and discounted any future costs of continued erosion control and resilience activities that may be postponed or prevented should the dredged material be used beneficially. Of the five sites in the EA, we recommend the material be placed on the shoreline of Wallops Island. This sand could be used to nourish the beach in general and/or specifically the area of recent beach sand removal at the northern end of the beach and landward of the large breakwaters (as we recommended during the review of that project). This sand would help stabilize Wallops Island and serve as a sediment source to the downdrift barrier islands, thereby benefiting this entire coastal system. We consider placement at Chincoteague National Wildlife Refuge Swan Cove a second choice for the beneficial use of the dredged material should beach placement not be possible.

An alternative not discussed in the EA, and our highest recommended option, is to rebuild Chincoteague Point, a small marsh island across the channel southwest of Curtis Merritt Harbor at the south end of Chincoteague Island. This island provides some protection to the harbor and southern Chincoteague and has eroded significantly over the past 15 years, thereby increasing exposure of southern Chincoteague to high-energy waves from Chincoteague Inlet. Restoring the island would require marsh plantings and shoreline stabilization (e.g. a stone sill) in addition to the dredged sediment. While considering an additional beneficial placement site, particularly one involving restoration of part of an island, is complicated and must be done with care, the benefits of restoring the protection provided by this island may prove beneficial to the longer-term resilience of Chincoteague. We recommend that the impacts of restoring this island are modeled as part of an alternatives analysis for determining a placement site.

Please let me know if you have any questions or require additional information.

Sincerely,

Emily Hein

Emily Hein
Assistant Director for Advisory Services

Copy:
NASA, VMRC, NOAA, Accomack County

Department of Environmental Quality

Attn: Janine Howard
1111 East Main Street
Richmond, VA 23219

Re: NASA Wallops Island Northern Development Project, DEQ 21-164F

Dear Ms. Howard,

This will respond to the request for comments regarding the Environmental Assessment and Federal Consistency Determination for the NASA Wallops Island Northern Development Project (DEQ 21-164F), prepared by the National Aeronautics and Space Administration (NASA). Specifically, NASA has proposed to impact tidal wetlands and subaqueous bottom habitat for the construction of a fixed pier and turning basin, a hangar at the Unmanned Aerial Systems (UAS) Airstrip, installation of new utility infrastructure, installation of airstrip lighting, hardening/reinforcement of a section of the airstrip, improvements to the airstrip access road, construction of a new pier access road adjacent to the UAS Airstrip, construction of a new 20 to 30 vehicle parking lot, construction of a project support building, and channel dredging (vessel approach channel). The project is located in Accomack County, Virginia.

We reviewed the provided project documents and found the proposed project to be within the jurisdictional areas of the Virginia Marine Resources Commission (VMRC) and the local Accomack County wetlands board. Please be advised that the VMRC pursuant to Chapters 12, 13, and 14 of Title 28.2 of the Code of Virginia administers permits required for submerged lands, tidal wetlands, and beaches and dunes. Additionally, the VMRC administers the enforceable policies of fisheries management, subaqueous lands, tidal wetlands, and coastal primary sand dunes and beaches, which comprise key components of Virginia's Coastal Zone Management Program. VMRC staff has reviewed the submittal and offers the following comments:

Fisheries and Shellfish: Private shellfish leases and public clam grounds are situated directly adjacent to the proposed channel. We cannot verify with the provided project drawings that the side slopes of the dredged channel will not directly impact lease number 22062. We have also verified that the adjacent shellfish leases 17290 and 19696 are active leases and have reported harvest. Additionally, Virginia Institute of Marine Science (VIMS) comments on this project report that the sandy plume from dredging is most likely to settle in areas adjacent to the channel quickly and that mitigation for sediment settling within the shellfish resource areas is needed. For this reason, we do not agree with the conclusion in the consistency report that “none of the Proposed Action Alternative activities involving disturbance of the subaqueous bottom would permanently disturb shellfish beds or affect their continued viability”. Therefore, the project as proposed is not consistent with our fisheries and shellfish enforceable policies. To comply with the policies a turbidity mitigation plan is required that includes dredging on slack tides and considers turbidity curtains. Additionally, surveyed channel designs that include the location of the 2x buffer and 4x buffer adjacent to the shellfish leases are needed to understand potential direct impacts to the leases.

Submerged Lands: The project as proposed will require the dredging of 94,000 cubic yards of State-owned bottom material. The federal act of dredging, however, is not jurisdictional to VMRC based on past guidance from the Office of the Attorney General.

Tidal Wetlands: A wetlands board permit with compensatory mitigation will be required from the Accomack County wetlands board for all proposed impacts to tidal wetlands.

Beaches and Coastal Primary Sand Dunes: Section 10.1-704 of the Code of Virginia provides that the beaches of the Commonwealth shall be given priority consideration as sites for the disposal of that portion of dredged material determined to be suitable for beach nourishment. This is further supported by VMRC's "Criteria for the Placement of Sandy Dredged Material along Beaches in the Commonwealth," Regulation 4 VAC 20-400-10 ET SEQ. The project, however, proposes to dispose approximately 94,0000 cubic yards of State-owned sandy bottom material into the Atlantic Ocean. This Commonwealth of Virginia resource has a market value of between $2.35 and $3.29 million dollars, and should be utilized as nourishment material for the ongoing Wallops Island Shoreline Enhancement Restoration project at the Wallops Flight Facility. This would then offset certain of the adverse environmental impacts raised by VIMS, the Department of Wildlife Resources (DWR) and The Nature Conservancy, associated with past projects (VMRC #18-1590 and #20-1745) and future plans to excavate sandy beach material from the north end of Wallops Island. According to DWR, the beach along this segment of Wallops Island supports nesting federally Endangered Piping Plovers and American Oystercatchers, designated a Tier IIa Species of Greatest Conservation Need (SGCN). In addition, this area is believed to provide nesting habitat for state Threatened Wilson's Plovers, federally Threatened Loggerhead Sea Turtles, Diamondbacked Terrapins (Tier ll SGCN), and other species identified in Virginia's Wildlife Action Plan as SGCNs.

Given the cumulative concerns noted above, this project is viewed as not consistent with Virginia's fisheries and shellfish enforceable policies and our beaches and dunes enforceable policies. If you have any questions please contact me at (757) 247-2251 or by email at randy.owen@mrc.virginia.gov. Thank you for the opportunity to comment.

Sincerely,

Randy Owen
Chief, Habitat Management Division

RO/cg
HM

COMMONWEALTH of VIRGINIA

Marine Resources Commission
380 Fenwick Road
Bldg 96
Fort Monroe, VA 23651-1064

Andrew R. Wheeler
Secretary of Natural and Historic Resources

Justin D. Worrell
Acting Commissioner

February 8, 2022

Department of Environmental Quality
Attn: Janine Howard
1111 East Main Street
Richmond, VA 23219

Re: NASA Wallops Island Northern Development Project, DEQ 21-164F

Dear Ms. Howard,

This will respond to the request for comments regarding the Environmental Assessment (EA) and Federal Consistency Determination for the NASA Wallops Island Northern Development Project (DEQ 21-164F), prepared by the National Aeronautics and Space Administration (NASA). Specifically, NASA has proposed to impact tidal wetlands and subaqueous bottom habitat for the construction of a fixed pier and turning basin, a hangar at the Unmanned Aerial Systems (UAS) Airstrip, installation of new utility infrastructure, installation of airstrip lighting, hardening/reinforcement of a section of the airstrip, improvements to the airstrip access road, construction of a new pier access road adjacent to the UAS Airstrip, construction of a new 20 to 30 vehicle parking lot, construction of a project support building, and channel dredging (vessel approach channel). The project is located in Accomack County, Virginia.

We reviewed the provided project documents and found the proposed project to be within the jurisdictional areas of the Virginia Marine Resources Commission (VMRC) and the local Accomack County wetlands board.

Please be advised that the VMRC pursuant to Chapters 12, 13, and 14 of Title 28.2 of the Code of Virginia administers permits required for submerged lands, tidal wetlands, and beaches and dunes. Additionally, the VMRC administers the enforceable policies of fisheries management, subaqueous lands, tidal wetlands, and coastal primary sand dunes and beaches, which comprise key components of Virginia's Coastal Zone Management Program. VMRC staff has reviewed the submittal and offers the following comments:

Fisheries and Shellfish: In accordance with Item F of the Marine Fisheries Enforceable Policy, any activity in the Commonwealth's tidal waters must not encroach upon the lawful use and occupation of previously leased ground for the term of the lease unless exercising riparian rights or the right of fishing. To comply with the policy a turbidity mitigation plan is required that includes dredging on slack tides and considers turbidity curtains. Additionally, surveyed channel designs that include the location of the 2x buffer and 4x buffer adjacent to the shellfish leases (22062, 17290, and 19696) are needed to understand potential direct impacts to the leases. Coordinate with VMRC to provide this necessary information.

Submerged Lands: The project as proposed will require the dredging of 94,000 cubic yards of State-owned bottom material with disposal of the sandy bottom into the Atlantic Ocean. The disposal of this valuable sand resource is not consistent with Virginia's Subaqueous Lands Enforceable Policy. It states "any activity affecting the subaqueous lands, including the taking and use of material from the bottomland, shall be guided by the Commonwealth's General Policy to conserve, develop, and utilize its natural resources, its public lands, and its historical sites and buildings and to protect its atmosphere, lands, and waters from pollution, impairment, or destruction, for the benefit, enjoyment, and general welfare of the people of the Commonwealth". The dredge material has an approximate market value of between $2.35 and $3.29 million dollars, and should be utilized as nourishment material for the ongoing Wallops Island Shoreline Enhancement Restoration project at the Wallops Flight Facility. Of the five sites in the EA, we recommend the material be placed on the shoreline of Wallops Island. Consistency with Virginia's Subaqueous Lands Enforceable Policy is, therefore, conditioned upon the beneficial use of the 94,000 cubic yards of state owned resource as recommended by the Virginia Institute of Marine Science in their January 27, 2022 EA comments.

Tidal Wetlands: A wetlands board permit with compensatory mitigation will be required from the Accomack County wetlands board for all proposed impacts to tidal wetlands.

Beaches and Coastal Primary Sand Dunes: No impacts to jurisdictional beaches and dunes are proposed; however, as noted in the submerged lands section above, we would recommend that any sandy dredged material be used beneficially. Beaches of the Commonwealth should be given priority consideration as sites for the disposal of that portion of dredged material determined to be suitable for beach nourishment. This is supported by Section 10.1-704 of the Code of Virginia, which states that beaches of the Commonwealth shall be given priority consideration as sites for the disposal of that portion of dredged material determined to be suitable for beach nourishment. This is further supported by VMRC's "Criteria for the Placement of Sandy Dredged Material along Beaches in the Commonwealth," Regulation 4 VAC 20-400-10 ET SEQ.

The use of dredged sandy material from this project as beach nourishment at the south end of the island would offset certain adverse environmental impacts raised by VIMS, the Department of Wildlife Resources (DWR) and The Nature Conservancy associated with past projects (VMRC #18-1590 and #20-1745), and future plans to excavate sandy beach material from the north end of Wallops Island. According to DWR, the beach along the northern segment of Wallops Island supports nesting federally Endangered Piping Plovers and American Oystercatchers, designated a Tier IIa Species of Greatest Conservation Need (SGCN). In addition, this area is believed to provide nesting habitat for state Threatened Wilson's Plovers, federally Threatened Loggerhead Sea Turtles, Diamondbacked Terrapins (Tier ll SGCN), and other species identified in Virginia's Wildlife Action Plan as SGCNs.

Given the cumulative concerns noted above, this project is viewed as not consistent with Virginia's Marine Fisheries and Subaqueous Lands enforceable policies.

Please contact me at (757) 247-2251 or by email at randy.owen@mrc.virginia.gov if you have any questions. Thank you for the opportunity to comment.

Sincerely,

Randy Owen
Chief, Habitat Management Division

RO/cg
HM

Federal Consistency Determination
Wallops Island Northern Development
National Aeronautics and Space Administration Wallops Flight Facility
Accomack County, Virginia

Introduction

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) propose to construct a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel (**Figures 1 and 2**). Pursuant to Section 307 of the Coastal Zone Management Act (CZMA) of 1972, as amended, and 15 Code of Federal Regulations (CFR) Subpart C, NASA has prepared this Federal Consistency Determination (FCD) to analyze potential effects on Virginia's coastal zone resources from the proposed implementation of onshore and in-water infrastructure improvements on the north end of Wallops Island and adjacent waters (Proposed Action) at WFF in Accomack County, Virginia. Federal actions occurring at WFF that could have reasonably foreseeable effects on coastal zone resources, such as the Proposed Action, must be consistent to the maximum extent practicable with the Enforceable Policies of the Virginia Coastal Zone Management Program (VCP). This FCD represents an analysis of the Proposed Action in light of established VCP Enforceable Policies and Programs, which were recently updated as part of a program change that was approved by the National Oceanic and Atmospheric Administration (NOAA) on October 2, 2020.

NASA is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) of 1969 to analyze the potential effects of the proposed action on the environment. The EA will be tiered from the May 2019 *NASA WFF Site-Wide Programmatic Environmental Impact Statement* (PEIS), in which NASA evaluated the environmental consequences of constructing and operating new facilities and infrastructure at WFF. The analysis presented herein is based on the more extensive analysis provided in the tiered EA. As the Lead Agency, NASA requested the cooperation of the Department of Transportation's Maritime Administration (MARAD) and the United States (U.S.) Army Corps of Engineers (USACE), Norfolk District in preparing the Wallops Island Northern Development (WIND) EA and this FCD, because they possess regulatory authority or specialized expertise pertaining to the Proposed Action. The EA and this FCD are being developed to fulfill each Federal agency's obligations under NEPA and the CZMA. NASA, as the WFF property owner and project proponent, is the lead agency and responsible for ensuring overall compliance with applicable environmental statutes, including NEPA and the CZMA.

Submission of this FCD reflects NASA's and VCSFA's commitment to comply to the maximum extent practicable with VCP Enforceable Policies and Programs. NASA has determined that the effects of the Proposed Action would be less than significant on land and water uses as well as natural resources of the Commonwealth of Virginia's coastal zone and is consistent to the maximum extent practicable with the enforceable policies of the VCP.

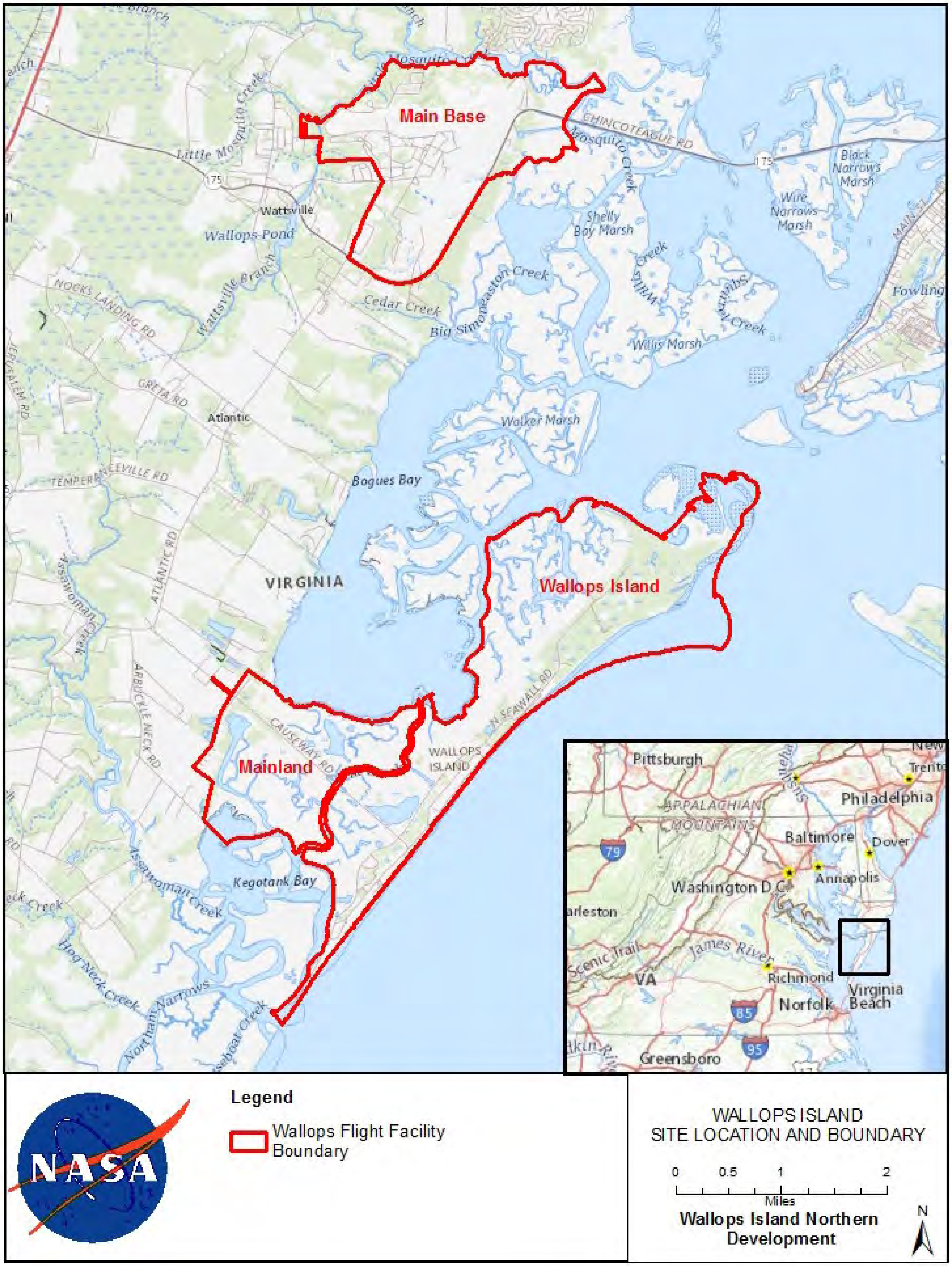

Figure 1. NASA WFF Location Map

Proposed Action

The Proposed Action would establish a new facility at Wallops Island as part of the MARAD M-95 "Marine Highway Project" designed to expand the use of America's navigable waters. The proposed infrastructure developments included in the Proposed Action would provide a port and operations area, including enhanced operational capabilities for NASA and the Mid-Atlantic Regional Spaceport (MARS). As a tenant of WFF, VCSFA owns and operates MARS, which consists of launch pads on the south end of Wallops Island as well as the Unmanned Aerial Systems (UAS) Airstrip and the Payload Processing Facility (PPF) on the north end of Wallops Island. The location of WFF and Wallops Island is shown on **Figure 1**.

Components of the Proposed Action are shown on **Figures 2**, **3**, and **4**, and further described below. Additional information about the Proposed Action and its individual components is provided in the Draft EA, which is being made available for a 30-day public review and comment period concurrently with the Virginia Department of Environmental Quality's (VDEQ) 60-day review of this FCD. The Draft EA is available on NASA WFF's website at: https://code200-external.gsfc.nasa.gov/250-WFF/WIND-EA.

Proposed Action In-Water Components

The MARS Port, including a 398-meter (m) (1,305-foot [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 2**). 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. Infrastructure (new facilities and improvements to the existing access road, airstrip, and utilities) would likewise be constructed or installed as part of the Proposed Action.

A variety of shallow draft (0.6- to 1.2-m [2- to 4-ft]) manned and unmanned vessels would be serviced by the 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 requiring approximately 2 m (8 ft) of draft. The Proposed Action would also include the dredging of a new and existing channel for enhanced vessel approach purposes (**Figure 3**). The new vessel approach channel (red line) would intersect with two Federal waterways, the Chincoteague Inlet Channel (orange line) and the Chincoteague Inlet to Bogues Bay connecting waters (blue line). Ultimately, the proposed channel would have a length of approximately 3,900 m (12,800 ft) and a final depth of 3.7 m (12 ft) below mean lower low water (MLLW). The proposed width of the approach channel (30.5-m [100-ft]) is consistent with the dimensions of the Chincoteague Inlet Federal Channel. Components of the Proposed Action are further described below.

Figure 2. Proposed Mars Port and Infrastructure Components

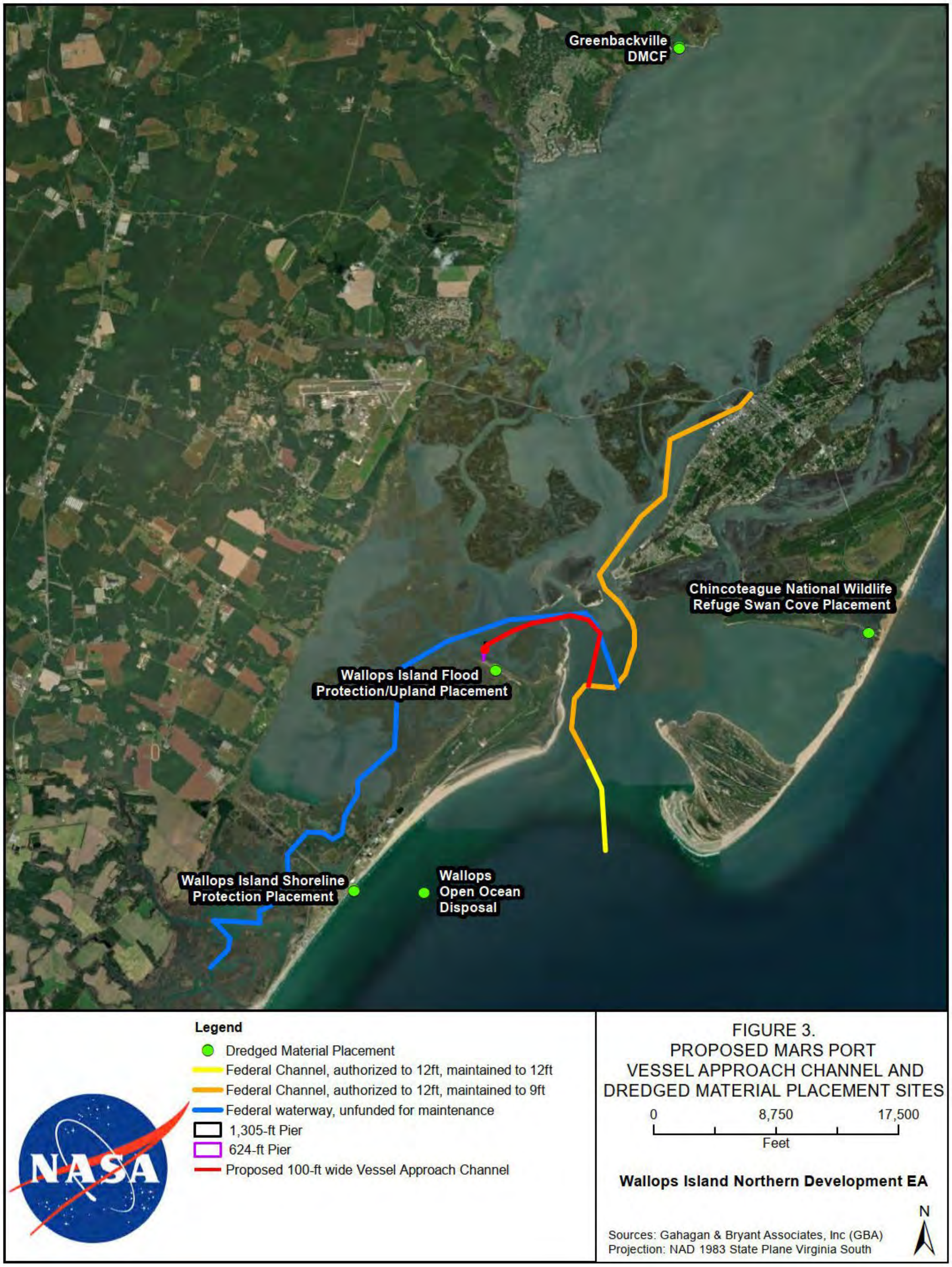

Figure 3. Proposed Mars Port Vessel Approach Channel and Dredged Material Placement Sites

Construction of the pier, dredging activities, and onshore facilities and infrastructure under the Proposed Action would be carried out in three (3) 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 4**);
- 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 4**) 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 portion of the channel from the Phase 2 turning basin to where it meets with the Chincoteague Inlet Federal Channel (shaded blue on **Figure 4**).

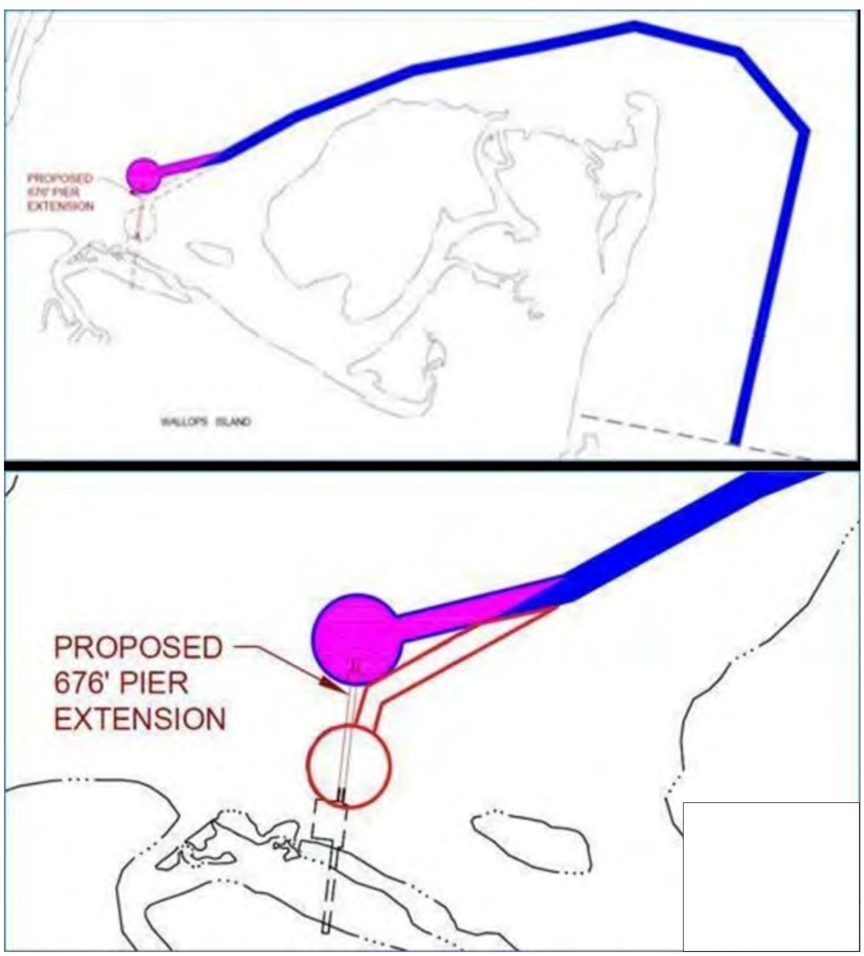

Figure 4. Diagram of Proposed Phased Construction

Estimated dredging volumes for the vessel approach channel and turning basin are provided in **Table 1**. The estimated timeframe for construction of the Proposed Action would have Phase 1 beginning in 2022 and being completed by 2024, with approximately 1 to 2 years between subsequent phases. Additional information about the proposed pier and other port components is provided in Chapter 2 of the Draft EA.

Five potential sites for the placement of dredged material are summarized in **Table 2** and shown on **Figure 3**. Further geotechnical investigation and associated physical and chemical laboratory analysis of sediment samples in the areas to be dredged is ongoing to determine the viability of the placement sites. The results of the geotechnical investigation and analysis is scheduled to be complete in 2021, prior to the dredged material placement. The analysis will also include an evaluation of suitability of reuse of the material for shoreline renourishment.

Table 1. Channel Dimensions and Estimated Dredging Volumes

	Phase 1	**Phase 2**	**Phase 3**
Channel depth	2.7 meters (m) (9 feet [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 cubic meters (m^3) (15,100 cubic yards [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 m3 (55,600 yd^3)	600 m^3 (800 yd^3)	28,900 m^3 (37,800 yd^3)
		Total Volume (Phases 1–3):	**72,000 m3 (94,200 yd^3)**

yd^3 = cubic yards

Table 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	Description
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)	--	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 USACE and a permit would be required for the use of this site.
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)	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 crossing 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 areas a similar distance to the dredging location, or the use of geotubes, or synthetic membranes, for containing the dredged material.

Table 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	Description
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)	The third dredged material placement option identified is the use of the upland 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. This option would require USACE to verify that there is sufficient capacity at the placement site for the dredged materials and would not interfere with existing agreements at the site. This option may also require additional permits.
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)	--	This option would involve the beneficial reuse of clean, compatible sand from the dredged material to repair and protect areas of the shoreline within the Launch Range area on Wallops Island. If dredged material is 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 such as hurricanes and Nor'easters. 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 11 km (6 nautical mi) to the shoreline.

Table 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	Description
							A specialized hydraulic unloader would be required to discharge the dredged material from the transport barges and pump the material onto the placement areas.
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)	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 under sized 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. Once pumped, USFWS will assume responsibility for sediment placement and is in the process of securing appropriate permits.

[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 or from the anchorage for a vessel loaded with dredged material.

Proposed Action Onshore Components

Onshore facilities and infrastructure that would be constructed or upgraded under the Proposed Action are summarized in **Table 3**. Their proposed locations are shown on **Figure 2**. Proposed upgrades within the scope of this project apply only to existing roads and utilities. No expansion beyond the proposed MARS Port and onshore facilities are anticipated at this time. Any future proposed changes would be addressed in additional NEPA and CZMA documentation.

Table 3. Onshore Proposed Action Components

Facility or Element	Description
Project Support Building	A new, approximately 740-square meter (m^2) (8,000-square foot [ft^2]) building may be constructed on at 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 facility is removed or demolished, the new facility 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 client usage. 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 without hindering 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 189,271-liter (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 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 may be conveyed to a proposed temporary holding tank where it would be periodically collected and pumped into the NASA wastewater system for treatment.

Table 3. Onshore Proposed Action Components	
Facility or Element	**Description**
Airstrip Lighting	New airstrip lighting meeting applicable Federal Aviation Administration (FAA) airfield standards may 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 (culvert widening)	The existing 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/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), which would widen the culvert crossing for the drainage channels to Cow Gut. Although the culvert will be longer, the diameter of the culvert will remain the same.
Vehicle Parking Lot	A new parking area with spaces for up to 30 vehicles would be constructed near the northwest intersection of the UAS Airstrip access road and runway. Use of permeable material for the parking lot surface may be a design consideration.
Runway Hardening for Port Access	A 30.5-m (100-ft) wide section of runway 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 along the north side of the existing UAS Airstrip from the intersection with the access road to the new MARS Port pier area.

Summary of Proposed Action Construction Activities

Construction of the Proposed Action would involve: (1) construction of the pier components that would make up the MARS Port; (2) dredging of the vessel approach channel, turning basin, and placement of dredged material; and (3) construction or improvement of the proposed onshore facilities and infrastructure.

The estimated timeframe for construction of the Proposed Action would have Phase 1 beginning in 2022 and being completed by 2024, with approximately 1 to 2 years between subsequent 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 at a later date). 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 398 m [1,305 ft]) would take approximately 9.5 months to complete.

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, tugboat, vibratory pile hammer, diesel impact hammer, concrete truck, concrete pump truck, concrete vibrator, generator, welding machines, cutting torches, and various small tools.

Summary of Proposed Action Operational Activities

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 fencing around the Revolutionary War Earthworks. During summer months, a mosquito fogging service truck sprays the Airfield once every 2 weeks. The pier structure would also require quarterly structural inspections.

Potential facility usage associated with the MARS Port is provided in **Table 4**.

Table 4. 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

Table 4. Potential MARS Port Operations/Facility Usage

Potential Facility Usage	Vessel Type	Quantity Assumptions	Total Barge / Vessel Trips	Phase Associated with Usage
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
		Total Barge / Vessel Trips	**99**	

Alternatives

NASA is considering three alternatives for implementation of the Proposed Action: the Proposed Action Alternative, which would implement Phases 1, 2, and 3 as described above; Alternative 1, which would consist of the implementation of Phase 1 only; and Alternative 2, which would consist of the implementation of Phases 1 and 2 only. Alternatives 1 and 2 would include the construction and operation of the onshore components described in **Table 3,** although the North Island Operations Center may be constructed at a later date.

The Proposed Action Alternative represents the most extensive set of potential effects on Virginia coastal zone resources and, as such, is the Alternative analyzed in detail in this FCD. The extent, duration, and intensity of potential effects from either Alternative 1 or Alternative 2 would be less relative to the Proposed Action Alternative due to their reduced scope of activities. Therefore, potential effects from the implementation of either Alternative 1 or Alternative 2 would not exceed those of the Proposed Action Alternative and are not addressed in the analysis presented in this FCD.

Enforceable Policies

The Commonwealth of Virginia has developed and implemented a federally approved VCP encompassing twelve enforceable policies, which were updated as part of a program change approved by NOAA on October 2, 2020. The VCP is administered by VDEQ and consists of a network of state agencies and local governments that regulate Virginia's coastal zone lands and resources. **Table 5** summarizes the Proposed Action Alternative's applicability to or consistency with these enforceable policies. The full text of the enforceable policies is provided in the Virginia Federal Consistency Manual prepared by the VDEQ Office of Environmental Impact Review dated October 2020.

Enforceable policies that NASA has determined are not applicable to the Proposed Action Alternative are not addressed further in this FCD. A summary analysis of the Proposed Action Alternative's consistency with the applicable Enforceable Policies follows **Table 5**. This analysis is based on the more detailed analyses presented in the Draft EA for the Proposed Action Alternative.

Table 5. VCP Enforceable Policies Applicability to or Consistency with the Proposed Action

Enforceable Policy	Applicability or Consistency[1]	Rationale if Not Applicable (N/A)
I. Tidal and Non-Tidal Wetlands	Consistent	--
II. Subaqueous Lands	Consistent	--
III. Dunes and Beaches	Consistent	--
IV. Chesapeake Bay Preservation Areas	N/A	The Proposed Action Alternative would not be implemented within or have the potential to affect lands designated as Chesapeake or Atlantic Protection Areas in Accomack County.
V. Marine Fisheries	Consistent	--
VI. Wildlife and Inland Fisheries	Consistent	--
VII. Plant Pests and Noxious Weeds	Consistent	--
VIII. Commonwealth Lands	N/A	The Proposed Action Alternative would not be implemented within or have the potential to affect Commonwealth Lands owned, operated, or otherwise under the jurisdiction of Virginia Department Wildlife Resources (VDWR) and/or Virginia Department of Conservation and Recreation (VDCR).
IX. Point Source Air Pollution	Consistent	--

Table 5. VCP Enforceable Policies Applicability to or Consistency with the Proposed Action		
Enforceable Policy	**Applicability or Consistency[1]**	**Rationale if Not Applicable (N/A)**
X. Point Source Water Pollution	N/A	The Proposed Action Alternative would not involve the establishment or modification of a new or existing point source discharge, respectively, to Virginia waters or asphalt paving within a Volatile Organic Compounds (VOC) Emission Control Area.
XI. Nonpoint Source Water Pollution	Consistent	--
XII. Shoreline Sanitation	Consistent	--
[1]"Consistent" indicates consistent, to the maximum extent practicable, with the Enforceable Policy.		

I. Tidal Wetlands and Non-Tidal Wetlands

***Consistent to the Maximum Extent Practicable*? YES**

Analysis

The Proposed Action Alternative would impact a total of 0.95 hectare (ha) (2.33 acres) of tidal wetlands from the construction of inland support infrastructure including the proposed vehicle parking lot, culvert improvements, port access road, and the approach pier. Of the 0.95 ha (2.33 acres), approximately 0.24 ha (0.59 acres) would be permanently impacted from permanent removal of the affected wetland area, while the remaining 0.71 ha (1.74 acres) would be temporarily impacted from activities such as rutting, soil compaction, vegetation damage from the placement and removal of matting, along with equipment movement and use during construction activities. The Proposed Action Alternative would have no effects on non-tidal wetlands because none are located in the Project Area.

Prior to beginning construction, NASA, VCSFA, and their contractors would obtain applicable permits required under the Clean Water Act (CWA) from USACE, Virginia Marine Resources Commission (VMRC), VDEQ, and/or the Accomack County Wetlands Board. NASA and VCSFA would comply with the monitoring, avoidance, and mitigation requirements specified by these permits. In addition, NASA and VCSFA would restore temporarily impacted tidal wetlands (vegetated and un-vegetated) to pre-construction condition and revegetate to the extent feasible. 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. Additional best management practices (BMPs) would be implemented to reduce impacts on tidal wetlands, which are described further in the Draft EA.

Adherence to the requirements of applicable permitting, BMPs, and restoration and mitigation measures would minimize short-term and long-term effects on tidal wetlands from implementation of the Proposed Action Alternative. Therefore, the Proposed Action Alternative is consistent to the maximum extent practicable with this enforceable policy.

II. Subaqueous Lands

***Consistent to the Maximum Extent Practicable*? YES**

Analysis

The subaqueous bottom of surrounding tidal waters, specifically the Ballast Narrows and Chincoteague Inlet, would be disturbed during proposed construction activities. Construction of the fixed pier and pier extension would require in-water work that would disturb underlying sediment and impact the subaqueous bottom. Dredging activities for the turning basin and vessel access channel would also impact the subaqueous bottom by removing up to approximately 72,000 cubic meters (m^3) (94,200 cubic yards [yd^3]) of dredge material under the Proposed Action Alternative. Operation of the Proposed Action Alternative is not likely to affect or disturb subaqueous lands, except for periodic maintenance dredging activities of the turning basin and access channel.

Disturbance of the subaqueous bottom during both construction and operation maintenance activities may result in sediment suspension and increased turbidity within Ballast Narrows and Chincoteague Inlet. Any effects on the subaqueous bottom would be temporary, and the extent, intensity, and duration would vary throughout the phases of the Proposed Action Alternative. None of the Proposed Action Alternative activities involving disturbance of the subaqueous bottom would permanently disturb shellfish beds or affect their continued viability. It is anticipated that the temporarily disturbed subaqueous bottom areas would return to pre-construction conditions through normal tide cycles and the settling of silt and sediment. Contractors would implement mitigation measures as necessary during construction to avoid and/or minimize impacts, and would incorporate and adhere to applicable BMPs, such as the use of sediment curtains, to minimize effects from subaqueous bottom disturbance. NASA would also obtain and adhere to the requirements of applicable permits issued by the VMRC.

Due to the temporary nature of potential effects on the subaqueous bottom, and through adherence to applicable compliance measures, the Proposed Action Alternative is consistent to the maximum extent practicable with this enforceable policy.

III. Dunes and Beaches

***Consistent to the Maximum Extent Practicable*? YES**

Analysis

No sand dunes or beaches are present within the Project Area and would not be affected by proposed construction or operation activities associated with the Proposed Action Alternative. Depending on which placement site is selected, dredge material could be placed along the sandy shoreline in the southern portion of Wallops Island to serve as beach replenishment material and to protect the beach from tidal impacts (Placement Option 4: Wallops Island Shoreline Protection Placement). Such placement of dredge materials would physically alter the beach, but only clean and compatible dredged sand would be used to repair the shoreline and would likely have a beneficial effect on beach function and stability. Additional analysis of the dredge material would be performed before selecting a location for placement.

Should dredge material be used for Wallops Island Shoreline Protection, this action would benefit the beach area by restoring and repairing it. Therefore, the Proposed Action Alternative would be consistent to the maximum extent practicable with this enforceable policy.

V. Marine Fisheries

***Consistent to the Maximum Extent Practicable*? YES**

Analysis

Construction of the Proposed Action Alternative would involve in-water work and dredging in Ballast Narrows and Chincoteague Inlet, and during operation, marine vessels would routinely use the surrounding waters and new access channel. Both construction and operation have the potential to affect commercial and recreational marine fisheries by disturbing fish populations and interfering with local fishing and harvesting activities. Various commercial fishing entities are located north of Wallops Island, and likely fish in the waters adjacent to the Project Site, along with recreational fishermen.

The Proposed Action Alternative would have temporary effects on marine fisheries, as in-water construction and dredging activities could disturb fish habitat, disturb or displace individuals, and/or involve temporary closures of waters adjacent to Wallops Island to minimize safety risks to transiting private or commercial vessels in the area. In the long term, vessel traffic associated with port operations may also disturb or displace fish populations, and could alter fishery activity, such as changing where fishing occurs or temporarily closing waters adjacent to Wallops Island to transiting private and commercial vessels to minimize safety risks and avoid vessel conflict. To address these potential effects, NASA and VCSFA would obtain the appropriate permits from VMRC, USACE, and Accomack County that would include measures to avoid adverse effects on aquaculture and ensure that long-term viability of oyster beds would not be affected by dredging activities. Bottom disturbances or disruptions from vessel use of the channel may affect individuals, but would not affect entire species or populations, or permanently degrade habitat. Implementation of the Proposed Action Alternative would not result in an increase in fishing and would have no potential to lead to overfishing.

The Proposed Action Alternative would not permanently impact fisheries management or conservation and, therefore, is consistent to the maximum extent practicable with this enforceable policy.

VI. Wildlife and Inland Fisheries

***Consistent to the Maximum Extent Practicable*? YES**

Analysis

Construction of the Proposed Action Alternative would have minor, short-term effects on terrestrial wildlife, resulting primarily 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 would be anticipated to avoid the Project Area and relocate into 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 adverse impacts; however, the number of individuals injured or destroyed during construction activities would be anticipated to remain small. Operation of the Proposed Action Alternative would involve increased vehicle traffic and human activity associated with the proposed MARS Port, which would have the potential to disturb terrestrial wildlife in nearby areas. Generally, common wildlife species displaced by the proposed facilities would be expected to relocate to other areas in and around the Project Area offering similar habitat conditions.

Similarly, aquatic species would experience minor, short-term effects resulting from proposed in-water construction work. Periodic dredging and pier/port construction, including in-water pile driving, is anticipated to cause mobile species to avoid to the area due to the increase in human and vessel activity and noise. Less-mobile species (e.g., benthic organisms) could be inadvertently destroyed by pile driving and/or dredging. In the long-term, increased human and vessel activity, as a result of the Proposed Action Alternative, would likely cause mobile aquatic species to avoid the area. There would be an increased potential for vessel strikes that could result in mortality or injury corresponding to the increased vessel traffic. However, increased vessel traffic would be small in the context of existing vessel traffic in the area. Periodic maintenance dredging of the channels would also have the potential to affect aquatic species, particularly benthic organisms.

Overall, effects on wildlife would primarily occur from habitat disturbance, and mobile wildlife would likely relocate to suitable habitat areas in or near the Project Area that would remain undisturbed by project activities. Effects on wildlife from the Proposed Action Alternative would occur at the individual level and would not prevent or delay the continued propagation of any population, community, or species.

The Project Area provides potential habitat for 18 federally or state-listed species and one species that is a candidate for federal listing. Construction and operation activities associated with the Proposed Action Alternative would not involve the intentional disturbance, harassment, or "take" of any listed species, nor would activities occur in areas of Wallops Island offering suitable nesting or breeding habitat for listed birds, sea turtles, or fish. The effects of the Proposed Action Alternative on listed species are evaluated in detail in concurrence letters submitted to the USFWS and NOAA Fisheries as part of the informal consultation process in accordance with Section 7 of the Endangered Species Act.

The Proposed Action Alternative would not involve administration of any drug to wildlife, nor does it include any actions related to predatory or undesirable species, or species designated as a nonindigenous aquatic nuisance.

For these reasons, the Proposed Action Alternative is consistent to the maximum extent practicable with this enforceable policy.

VII. Plant Pests and Noxious Weeds

***Consistent to the Maximum Extent Practicable*? YES**

Analysis

Under the Proposed Action Alternative, all temporarily disturbed areas that would not be developed or otherwise built on would be replanted with native vegetation in accordance with NASA WFF and USFWS Wallops National Wildlife Refuge vegetation management policies or maintained in a permeable condition. In accordance with the 2014 *WFF Wallops Island Phragmites Control Plan*, all tracked equipment involved in earth work would be inspected and cleaned to remove any rhizomes and seeds prior to arrival on the construction site. If proposed earth work requiring tracked equipment would occur in an area where *Phragmites* is known to occur, this portion of earthwork would be conducted last, or the equipment would be cleaned prior to use on another portion of the Project Area. Measures designed to prevent the spread of *Phragmites* would also prevent the spread of plant pests and noxious weeds (e.g., mowing of small infestations and restricting construction equipment from areas prone to invasion).

The Proposed Action Alternative would not involve violation of any quarantine established by the Board of Agriculture and Consumer Services or the Commissioner of Agriculture and Consumer Services, nor would it involve the importation of any infested regulated articles that could endanger public health.

Therefore, the Proposed Action Alternative would be consistent to the maximum extent practicable with this enforceable policy.

IX. Point Source Air Pollution

***Consistent to the Maximum Extent Practicable*? YES**

Analysis

Construction activities associated with the Proposed Action Alternative would temporarily generate increased emissions from construction equipment, workers' commuting vehicles, and fugitive dust. Short-term effects on air quality would be minimized by using BMPs such as wetting exposed soils to minimize fugitive dust, minimizing idling equipment and vehicles, and maintaining construction vehicle and equipment exhaust systems in optimal condition. The construction contractor would adhere to applicable air pollution control regulations and BMPs to minimize air pollution emissions during asphalt paving operations. In the long-term, the Proposed Action Alternative would lead to a reduction in air emissions by removing potentially hazardous and less efficient transportation operations off of roadways.

The location of the Proposed Action Alternative is not within a VOC Emissions Control Area and the area is in attainment for all criteria pollutants regulated by the Clean Air Act. As such, short-term and long-term emissions from the Proposed Action Alternative would have no potential to substantially degrade or change the area's attainment status.

The Proposed Action Alternative would not involve open burning, the establishment of new stationary sources of pollutant emissions, or the construction, reconstruction, relocation, or modification of regulated stationary sources.

For these reasons, the Proposed Action Alternative would be consistent to the maximum extent practicable with this enforceable policy.

XI. Nonpoint Source Water Pollution

***Consistent to the Maximum Extent Practicable*? YES**

Analysis

The Proposed Action Alternative would involve more than 929 m^2 (10,000 ft^2) of land disturbance. The construction contractor would be required to prepare and implement an Erosion and Sediment Control Plan (ESCP) in accordance with the Virginia Erosion and Sediment Control Regulations (9 VAC 25-840-40). Because the Proposed Action would disturb more than 0.4 ha (1 acre), the construction contractor would also obtain coverage under Virginia's General Permit for Discharges of Stormwater from Construction Activities (Construction General Permit [CGP]) in accordance with Virginia Water Quality Standards (9 VAC 25-260-50). Coverage under the CGP would require the construction contractor to prepare and adhere to a site-specific Stormwater Pollution Prevention Plan (SWPPP). Adherence to the requirements of the CGP and the ESCP would manage the quantity and quality of stormwater discharged from land-disturbing activities associated with the Proposed Action and would minimize adverse effects on water quality in receiving water bodies. NASA would review construction and development plans involving land disturbance and would conduct periodic inspections and any necessary enforcement in accordance with the terms of the ESCP, CGP, and SWPPP. In addition, 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 on-site. Following the completion of construction activities, disturbed areas of the Project Area not built on or otherwise developed would be returned to their pre-development hydrology, to the maximum extent technically feasible. The Proposed Action would not establish new nonpoint sources of water pollution. As such, the Proposed Action would be consistent to the maximum extent practicable with this enforceable policy.

XII. Shoreline Sanitation

Consistent to the Maximum Extent Practicable? N/A

Analysis

Wastewater generated at the proposed onshore facilities may either be conveyed to existing sanitary sewer infrastructure on Wallops Island, or to a temporary holding tank where it would be periodically collected and pumped for treatment into the existing NASA wastewater system. Sewage generated by the Proposed Action at these onshore facilities would ultimately be treated at WFF's existing wastewater treatment plant on the Main Base to meet applicable regulatory criteria prior to discharge. Temporary facilities used during construction may also be used in the short-term; however, these facilities would not be connected to the existing sanitary sewer infrastructure. Any wastewater and sewage generated from construction facilities would likely be collected and transported for treatment off-site. The Proposed Action would neither involve the installation of new septic tanks nor the modification or alternation of existing septic tanks, as none are located on or in the vicinity of the Project Area. Therefore, the Proposed Action would be consistent to the maximum extent practicable with this enforceable policy.

Certification

Based on the analysis presented above, and the more detailed analysis presented in the Draft EA, NASA has determined that the Proposed Action described herein would be consistent with the Enforceable Policies of the VCP. Pursuant to 15 CFR Section 930.41, the VCP has 60 days from the receipt of this document in which to concur with or object to this Consistency Determination, or to request an extension under 15 CFR section 930.41(b). Virginia's concurrence will be presumed if its response is not received by NASA on the 60th day from receipt of this determination. The Commonwealth's response should be sent to:

Shari A. Miller
Center NEPA Manager & Environmental Planning Lead
NASA GSFC Wallops Flight Facility
Wallops Island, VA 23337
(757) 824-2327
Shari.A.Miller@nasa.gov

APPENDIX D –

ESSENTIAL FISH HABITAT

CONSULTATION

Kisak, Natalie

From: Miller, Shari (WFF-2500) <shari.a.miller@nasa.gov>
Sent: Friday, February 17, 2023 1:31 PM
To: David OBrien - NOAA Federal
Cc: Emily A. Hein; Bahnson, Sara E CIV USARMY CENAO (US); Karen Greene; Meyer, T J (WFF-2500); Brittingham, Alan L. (WFF-013.0)[Virginia Commercial Space Flight Authority]; Levine, Lori (GSFC-2500)
Subject: RE: [EXTERNAL] NASA Wallops Island Northern Development; EFH assessment response
Attachments: NASA WIND EFH letter_Response_17Feb2023.pdf

Good afternoon, Dave,

Please find attached NASA's letter in response to your letter dated February 13, 2023, providing comment and recommendations on a previously submitted consultation letter and essential fish habitat (EFH) assessment, dated December 13, 2022, for the proposed Wallops Island Northern Development project.

Thank you for your participation in NASA's EA process for the proposed project. If you have any additional questions prior to publication of the Final EA, please contact me at Shari.A.Miller@nasa.gov.

Shari A. Miller
Center NEPA Manager and
Environmental Planning Lead
NASA GSFC Wallops Flight Facility
Wallops Island, VA 23337
(757) 824-2327
Shari.A.Miller@nasa.gov
Environmental Planning & Impact Assessment (nasa.gov)

"A single act of kindness throws out roots in all directions and the roots spring up and make new trees." – Amelia Earhart

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From: David OBrien - NOAA Federal <david.l.obrien@noaa.gov>
Sent: Monday, February 13, 2023 12:17 PM
To: Miller, Shari (WFF-2500) <shari.a.miller@nasa.gov>
Cc: Emily A. Hein <eahein@vims.edu>; Bahnson, Sara E CIV USARMY CENAO (US) <Sara.E.Bahnson@usace.army.mil>; Karen Greene <karen.greene@noaa.gov>
Subject: [EXTERNAL] NASA Wallops Island Northern Development; EFH assessment response

Hello Shari,

Attached here please find our response letter to the EFH assessment submitted by NASA for the WIND MARS Port project.

Please feel free to contact me if you have any questions.

Best regards,
Dave

David L. O'Brien
Fisheries Biologist
NOAA Fisheries Service
P.O. Box 1346
1370 Greate Rd.
Gloucester Point, VA 23062
804-684-7828
david.l.obrien@noaa.gov

National Aeronautics and Space Administration

Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337

Reply to Attn of: 250.W February 17, 2023

Mr. David O'Brien
Fisheries Biologist
NOAA Fisheries
P.O. Box 1346
1370 Greate Road
Gloucester Point, VA 23062

Re: Essential Fish Habitat Assessment: NASA Wallops Island Northern Development Project, Accomack County, Virginia

Dear Mr. O'Brien:

This letter is in response to your letter dated February 13, 2023, providing comment and recommendations on a previously submitted consultation letter and essential fish habitat (EFH) assessment, dated December 13, 2022. In accordance with Section 305(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the National Aeronautics and Space Administration (NASA) is providing a written response to the EFH conservation recommendations contained within your response.

As described in the previous consultation letter, NASA and the Virginia Commercial Space Flight Authority (VCSFA) are proposing to construct a pier for barge access and berthing and to dredge a vessel approach channel connecting to the Chincoteague Inlet Federal Channel at the northern end of NASA's Wallops Island. NASA has prepared an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) to analyze the potential effects of the proposed action on the environment. This EA has been tiered from the May 2019 *NASA Wallops Flight Facility Site-Wide Programmatic Environmental Impact Statement*, in which NASA evaluated the environmental consequences of constructing and operating new facilities and infrastructure at Wallops Flight Facility (WFF).

NASA will include the following EFH conservation recommendations provided by NOAA Fisheries in the Final EA to address and minimize potential impacts to EFH and other aquatic resources:

- Conduct all dredging during stages of the tide that allows the sandy dredge material to settle quickly from the water column; e.g. during slack tide or when tidal currents will carry resuspended sediment away from shellfish resources.
- Employ other means to reduce turbidity moving away from the dredge such as turbidity curtains or operational best management practices (i.e., reduced bucket ascent rates) to help protect shellfish resources.

- Employ impact hammer 'soft-start' procedure at reduced hammer energy when installing 24-inch square, pre-stressed concrete piles during pier construction.
- Compensate for the 0.37 acres of tidal wetland (permanent) impacts in accordance with the USACE/EPA 2008 Compensatory Mitigation Rule as proposed.
- Restore 1.64 acres of tidal wetland (temporary) impacts to pre-construction conditions and revegetate if necessary as proposed. Monitor wetland vegetation to ensure successful restoration of these areas.

Additionally, NASA plans to make every effort to implement the following recommendation, but notes that the ability to do so will be contingent on the availability of funding for each phase of the proposed project:

- Place all Phase 1 beach-quality, sandy dredge material at the North Wallops Island beach borrow area for beneficial use as proposed. Coordinate Phase 2 and Phase 3 dredging operations with ongoing WFF shoreline renourishment actions.

NASA understands that these recommendations are important to minimize potential adverse resource impacts, and plans to implement these recommendations to the extent practicable to avoid, mitigate, or offset potential impacts to EFH or other aquatic resources resulting from the proposed project. Should the project plans change or new information become available, NASA acknowledges that consultation would need to be reinitiated.

NASA thanks NOAA Fisheries for its participation in the EA process for the proposed project. If you have any additional questions prior to publication of the Final EA, please contact Ms. Shari Miller at NASA WFF, via phone at (757) 824-2327, or email at Shari.A.Miller@nasa.gov.

Sincerely,

Shari A. Miller
Center NEPA Manager

cc:
250/Ms. K. Finch
250/Mr. T. Meyer
MARAD/Mr. A. Finio
USACE/Mr. S. Bahnson
VCSFA/Mr. A. Brittingham

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
55 Great Republic Drive
Gloucester, MA 01930

February13, 2023

Shari A. Miller
Center NEPA Manager
NASA Wallops Flight Facility
34200 Fulton Street
Building F-160 / Room C-165
Wallops Island, VA 23337

Re: Essential Fish Habitat Assessment: NASA Wallops Island Northern Development Project

Dear Ms. Miller:

We have reviewed the essential fish habitat assessment and supporting materials for the Wallops Island Northern Development (WIND) project on the northern end of NASA's Wallops Island located in Accomack County, Virginia. The project includes the construction of a port facility that includes a pier and operations area to provide barge access and berthing to offload large launch vehicle components and related equipment for NASA and the Mid-Atlantic Regional Spaceport (MARS). Though the WIND project will be phased, elements of the MARS Port project include:

- construction of a 1,305 ft. long fixed-pier (624 ft. Phase 1, 676 ft. extension Phase 2),
- dredging 200-ft. radius turning basin (Phase 1 and 2),
- dredging a vessel approach channel approximately 12,800 ft. long and 100 ft. wide to connect to Chincoteague Federal Navigation Channel (Phases 1 and 3),
- construction of a second hanger at the unmanned aerial systems (UAS) runway
- construction of a new support building; and
- improvements to the access road, culvert pipe and utilities supporting UAS airstrip and MARS Port.

Project Background

The MARS Port project includes construction of a fixed pier using 24-inch square, pre-stressed concrete piles at the northwest terminus of the Wallops Island Unmanned Aerial Systems Airstrip. Phase 1 of the project includes constructing a 30 ft. wide by 624 ft. long pier with boat ramp and travel lift. It also includes dredging 34 acres of subaqueous bottom to create the new access channel will connect the MARS pier located in Bogues Bay to the inner and outer Chincoteague Inlet Channels, which are two contiguous federal navigation channels connecting Bogues Bay to the Atlantic Ocean. Approximately 57,000 cu. yds. of material (Phase 1) will be dredged to create the 100 ft. wide by 12,800 ft. long access channel and 200 ft. radius turning basin to an initial depth of -9 ft. MLLW. All dredging will be conducted using a mechanical clamshell dredge and placed directly into scows. Based on geotechnical sampling and analysis, the material to be dredged contains approximately 95% sand. The beach-quality, sandy dredge material will be transported via scows to the North Wallops Island beach borrow area and placed for beneficial use. Ultimately, the access channel will be dredged to -12 ft. MLLW (additional 37,800 cu. yds.) during Phase 3 to match the authorized depth of the Chincoteague Inlet Channels. Phase 3 construction will be driven by the need for the additional navigable depth and available funding.

Magnuson Stevens Fishery Conservation and Management Act (MSA)

The MSA requires federal agencies, such as NASA, to consult with us on any action or proposed action authorized, funded, or undertaken, by such agency that may adversely affect EFH identified under the MSA. This process is guided by the requirements of our EFH regulation at 50 CFR 600.905, which mandates the preparation of EFH assessments and generally outlines each agency's obligations in the consultation process. The level of detail in an EFH assessment should be commensurate with the complexity and magnitude of the potential adverse effects of the action.

The Atlantic Ocean, Bogues Bay, Chincoteague Inlet and the surrounding coastal bays, creeks, and marshes have been designated essential fish habitat (EFH) for a variety of life stages of fish managed by the New England Fishery Management Council (NEFMC), Mid-Atlantic Fishery Management Council (MAFMC), South Atlantic Fishery Management Council (SAFMC), and NOAA Fisheries because these areas provide feeding, resting, nursery, and staging habitat for a variety of commercially, recreationally, and ecologically important species. Species for which EFH has been designated in the proposed project area include Atlantic butterfish (*Peprilus triacanthus*), bluefish (*Pomatomus saltatrix*), black sea bass (*Centropristis striata*), scup (*Stenotomus chrysops*), summer flounder (*Paralichthys dentatus*), windowpane flounder (*Scophthalmus aquosus*), clearnose skate (*Raja eglanteria*), and winter skate (*Leucoraja ocellata*). The project area is also designated EFH for several Atlantic highly migratory species (tuna, swordfish, billfish, small and large coastal sharks, and pelagic sharks) including albacore tuna (*Thunnus alalunga*), sandbar shark (*Carcharhinus plumbeus*), smoothhound shark complex (Atlantic stock), and sand tiger shark (*Carcharias taurus*). NOAA has listed the sand tiger shark as a Species of Concern. Species of Concern are those species for which we have concerns regarding status and threats. The goal of listing a species as a Species of Concern is to promote proactive conservation efforts to help preclude the need to list them under the Endangered Species Act in the future. Furthermore, coastal inlets such as Chincoteague Inlet are designated as EFH for Spanish mackerel (*Scomberomorus maculatus*) and king mackerel (*Scomberomorus cavalla*).

As stated in the EFH assessment, the project will result in impacts to EFH. These impacts include temporary (1.64 acres) and permanent (0.37 acres) impacts to tidal wetlands resulting from shading impacts of the pier and extension of the tidal road culvert. Additional impacts include the direct removal of the benthic community and temporary increases in turbidity during mechanical dredging. Suspended sediment may result in turbidity plumes carried over and settling upon public and private shellfish beds. Eastern oyster (*Crassotrea virginica*) and hard clams (*Mercenaria mercenaria*) provide important environmental benefits by removing excess nutrients and improving water quality. Underwater noise will also be generated during dredging and pile driving which could adversely affect the movement of resident and transient species through the project area.

EFH Conservation Recommendations

The new channel lies immediately adjacent to extensive public and private shellfish grounds in Bogues Bay. Based on previous studies cited in our Regional turbidity table we are concerned that the potential turbidity plume generated by a mechanical dredge may result in sediment moving onto shellfish grounds. http://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-effect-analysis-turbidity-greater-atlantic-region

Therefore, pursuant to Section 305(b)(4)(A) of the MSA, we recommend you adopt the following EFH conservation recommendations to minimize impacts from dredging and other construction activities to EFH and other aquatic resources, including shellfish:

1. Conduct all dredging 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.
2. In locations where recommendation 1 is not practical, employ other means 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.
3. Employ impact hammer 'soft-start' procedure at reduced hammer energy when installing 24-inch square, pre-stressed concrete piles during pier construction.
4. Place all Phase 1 beach-quality, sandy dredge material at the North Wallops Island beach borrow area for beneficial use as proposed (Option 4). Coordinate Phase 2 and Phase 3 dredging operations with ongoing WFF shoreline renourishment actions.
5. Compensate for the 0.37 acres of tidal wetland (permanent) impacts in accordance with the USACE/EPA 2008 Compensatory Mitigation Rule as proposed.
6. Restore 1.64 acres of tidal wetland (temporary) impacts to pre-construction conditions and revegetate if necessary as proposed. Monitor wetland vegetation to ensure successful restoration of these areas.

Please note that Section 305(b)(4)(B) of the MSA requires you to provide a written response to us within 30 days after receiving our EFH conservation recommendations. The response must include a description of measures proposed for avoiding, mitigating, or offsetting the impact of the activity on EFH, as required by section 305(b)(4)(B) of the MSA and 50 CFR 600.920(j). In the case of a response that is inconsistent with our conservation recommendations, you must explain your reasons for not following the recommendations, including the scientific justification for any disagreements with us over the anticipated effects of the action or the measures needed to avoid, minimize, mitigate, or offset such effects. Please also note that further EFH consultation must be reinitiated pursuant to 50 CFR 600.920(j) if new information becomes available, or if the project is revised in such a manner that affects the basis for the above determination.

Other NOAA Trust Resources

Federally listed species may be present in the project area. Consultation, pursuant to Section 7 of the Endangered Species Act (ESA) of 1973, may be necessary. When project plans are complete, you should submit their determination of effects, along with justification for the determination, and a request for concurrence to nmfs.gar.esa.section7@noaa.gov. After reviewing this information, our Protected Resources Division would then be able to conduct a consultation under Section 7 of the ESA, if necessary. Please contact Mr. Brian Hopper, NOAA Protected Resources Division (brian.d.hopper@noaa.gov, 240-628-5420) if you have any questions about the ESA consultation process of to discuss potential impacts to federally listed species under our jurisdiction.

Thank you for the opportunity to review the EFH assessment prepared for the NASA Wallops Island Northern Development, MARS Port project. Please contact Mr. David O'Brien in our Virginia field office (david.l.obrien@noaa.gov, 804-684-7828) if you have any questions.

Sincerely,

Louis A. Chiarella
Assistant Regional Administrator
for Habitat and Ecosystem Services

cc: Emily Hein, VIMS
Sara Bahnson, NAO Corps

Kisak, Natalie

From: Miller, Shari (WFF-2500) <shari.a.miller@nasa.gov>
Sent: Tuesday, December 13, 2022 4:33 PM
To: Karen.Greene@noaa.gov
Cc: Finio, Alan (MARAD); Brian Hopper (Brian.D.Hopper@noaa.gov); Finch, Kimberly (GSFC-2500); Meyer, T J (WFF-2500); David O'Brien (david.l.obrien@noaa.gov); Levine, Lori (GSFC-2500); Brittingham, Alan L. (WFF-013.0)[Virginia Commercial Space Flight Authority]; Bahnson, Sara E CIV USARMY CENAO (USA)
Subject: RE: Project Review Request, Wallops Island Northern Development, NASA WFF
Attachments: NASA WFF WIND - NOAA_EFH Consult Ltr_121322.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Ms. Greene:

Based upon public comments received on the draft Wallops Island Northern Development Environmental Assessment (WIND EA) and your agency's comments on the Essential Fish Habitat (EFH) consultation letter, NASA Wallops Flight Facility and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) are resubmitting the attached consultation. NASA and VA Space propose to construct of a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel. NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Endangered Species Act (ESA) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfil their requirements.

Based on the attached EFH assessment, NASA has determined that the effects of the Proposed Action on EFH would not be substantial. I certify that we have used the best scientific and commercial data available to complete this assessment and request your concurrence with this determination. If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Thank you.

Shari A. Miller
Center NEPA Manager and
Natural Resources Lead
NASA GSFC Wallops Flight Facility
Wallops Island, VA 23337
(757) 824-2327
Shari.A.Miller@nasa.gov
https://code200-external.gsfc.nasa.gov/250-wff/

"The smallest act of kindness is worth more than the grandest intention." – Oscar Wilde

From: Miller, Shari A. (WFF-2500)
Sent: Wednesday, November 10, 2021 12:05 PM
To: Karen.Greene@noaa.gov
Cc: Nate Overby <nathan.overby@vaspace.org>; Finio, Alan (MARAD) <alan.finio@dot.gov>; brian.c.denson@usace.army.mil; Brian Hopper (Brian.D.Hopper@noaa.gov) <Brian.D.Hopper@noaa.gov>; Finch, Kimberly (GSFC-2500) <kimberly.s.finch@nasa.gov>; TJ Meyer <theodore.j.meyer@nasa.gov>; David O'Brien (david.l.obrien@noaa.gov) <david.l.obrien@noaa.gov>; Levine, Lori M. (GSFC-2500) <lori.m.levine@nasa.gov>
Subject: Project Review Request, Wallops Island Northern Development, NASA WFF

Dear Ms. Greene:

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) propose to construct a pier for barge access and berthing and to dredge a vessel approach channel connecting to the Chincoteague Inlet Federal Channel. NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Essential Fish Habitat (EFH) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfil their requirements.

Based on the attached EFH assessment, NASA has determined that the effects of the Proposed Action on EFH would not be substantial. I certify that we have used the best scientific and commercial data available to complete this assessment and request your concurrence with this determination. If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Thank you.

Shari A. Miller
Center NEPA Manager &
Natural Resources Manager
NASA GSFC Wallops Flight Facility
Wallops Island, VA 23337
(757) 824-2327
Shari.A.Miller@nasa.gov
https://code200-external.gsfc.nasa.gov/250-wff/

"Remember there's no such thing as a small act of kindness. Every act creates a ripple with no logical end." —Scott Adams

National Aeronautics and Space Administration

Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337

Reply to Attn of: 250.W December 13, 2022

Ms. Karen Greene
Mid-Atlantic Field Office Supervisor and EFH Coordinator
Greater Atlantic Regional Fisheries Office
NOAA Fisheries
55 Great Republic Drive
Gloucester, MA 01930

Subject: Project Review Request, Wallops Island Northern Development, NASA Wallops Flight Facility, Accomack County, Virginia

Dear Ms. Greene:

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) propose to construct a pier for barge access and berthing and to dredge a vessel approach channel connecting to the Chincoteague Inlet Federal Channel (**Figures 1 and 2**). NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Essential Fish Habitat (EFH) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfill their requirements.

NASA is preparing an Environmental Assessment (EA) in compliance with NEPA to analyze the potential effects of the proposed action on the environment. The EA will be tiered from the May 2019 *NASA WFF Site-Wide Programmatic Environmental Impact Statement* (PEIS), in which NASA evaluated the environmental consequences of constructing and operating new facilities and infrastructure at WFF.

The purpose of this letter is to provide information about the proposed project and to request your concurrence with our determination regarding potential effects on EFH. NASA has evaluated the potential for the project to adversely affect EFH in accordance with the Magnuson-Stevens Fishery Conservation and Management Act (MSA). NASA used the Greater Atlantic Regional Fisheries Office EFH Assessment Worksheet to evaluate potentially affected EFH, and we are submitting our evaluation and findings for your review. The EFH Assessment Worksheet is provided in Attachment 1. We have determined that the impact of the Proposed Action on EFH would not be substantial and request an abbreviated EFH consultation.

Background

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 2019a). The M-95 Marine Highway Corridor 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 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 2019b).

VCSFA 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 STEM 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 launches to orbital trajectories. This led to the establishment of the Mid-Atlantic Regional Spaceport (MARS) which is owned and operated by VCSFA.

Development of a port and operations area to support the activities of NASA, WFF tenants, and MARS at the north end of Wallops Island was evaluated at a programmatic level of detail in the 2019 *Final Site-wide PEIS* (NASA 2019). NASA has several long-term tenants and customers that use the WFF research airport and Wallops Island launch range, its facilities, and airspace.

Description of the Proposed Action

Under the Proposed Action, the MARS Port, including a 398-meters (m) (1,305-feet [ft]) fixed pier and turning basin, would be constructed adjacent to the unmanned aerial system (UAS) airstrip located at the north end of Wallops Island (**Figures 1 and 2**). 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 intermodal facility as part of the MARAD M-95 Marine Highway Corridor. Infrastructure (new upland facilities and improvements to the existing access road, airstrip, and utilities) would likewise be constructed or installed as part of the Proposed Action. Access road improvements would include widening of an existing culvert. Although shown for completeness in **Figure 2**, upland activities that would not affect essential fish habitat are not discussed further.

The Proposed Action would also include the dredging of a new and existing channel to enhance the vessel approach to the pier (**Figure 3**). Mechanical dredging (i.e., clamshell bucket dredge) would be utilized for all dredging activities associated with the Proposed Action. 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 vessel approach channel, which interfaces with two Federal waterways, the Chincoteague Inlet Channel and the Chincoteague Inlet to Bogues Bay connecting waters would initially be used by a variety of shallow-draft vessels. Ultimately, the proposed channel would have a length of approximately 3,900 m (12,800 ft), a width of 30 m (100 ft), and a final depth of 3.7 m (12 ft) below mean lower low water (MLLW). Components of the Proposed Action are further described below.

Purpose and Need for the Proposed Action

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 a port, which includes a pier and operations area (MARS Port), 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 from roadways. Water transportation has 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 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.

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 vessels/autonomous 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.

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. Replacing aging or 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 contribute to improving aging or 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 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 AUV/ASV customers to develop and test their vehicles either alone or in concert with the existing UAS airstrip. The dredging of an approach channel to a final depth of 3.7 m (12 ft) below MLLW is the optimal depth to allow 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 route 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.

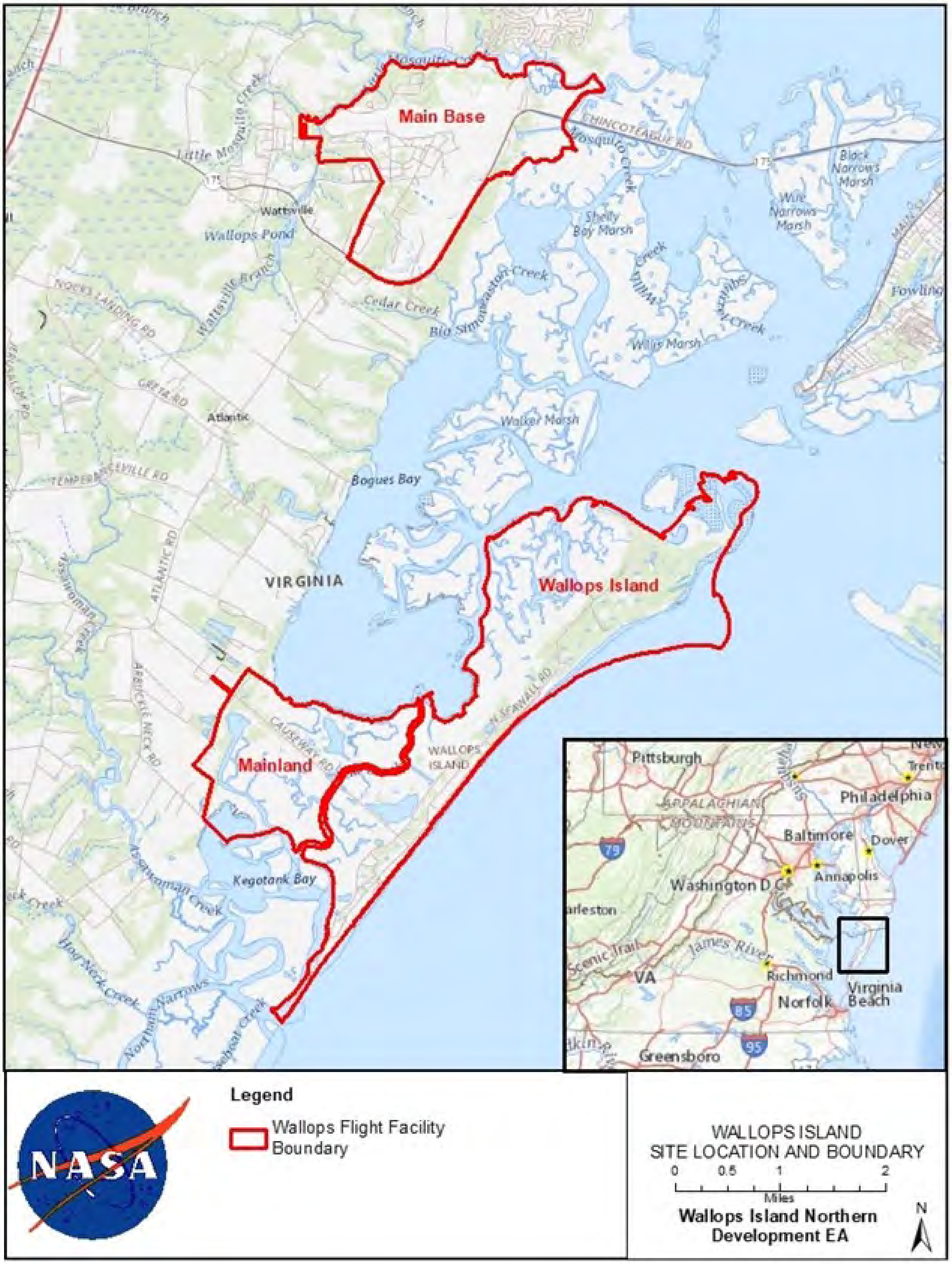

Figure 1: NASA WFF Location

Figure 2: Proposed MARS Port and Infrastructure Components

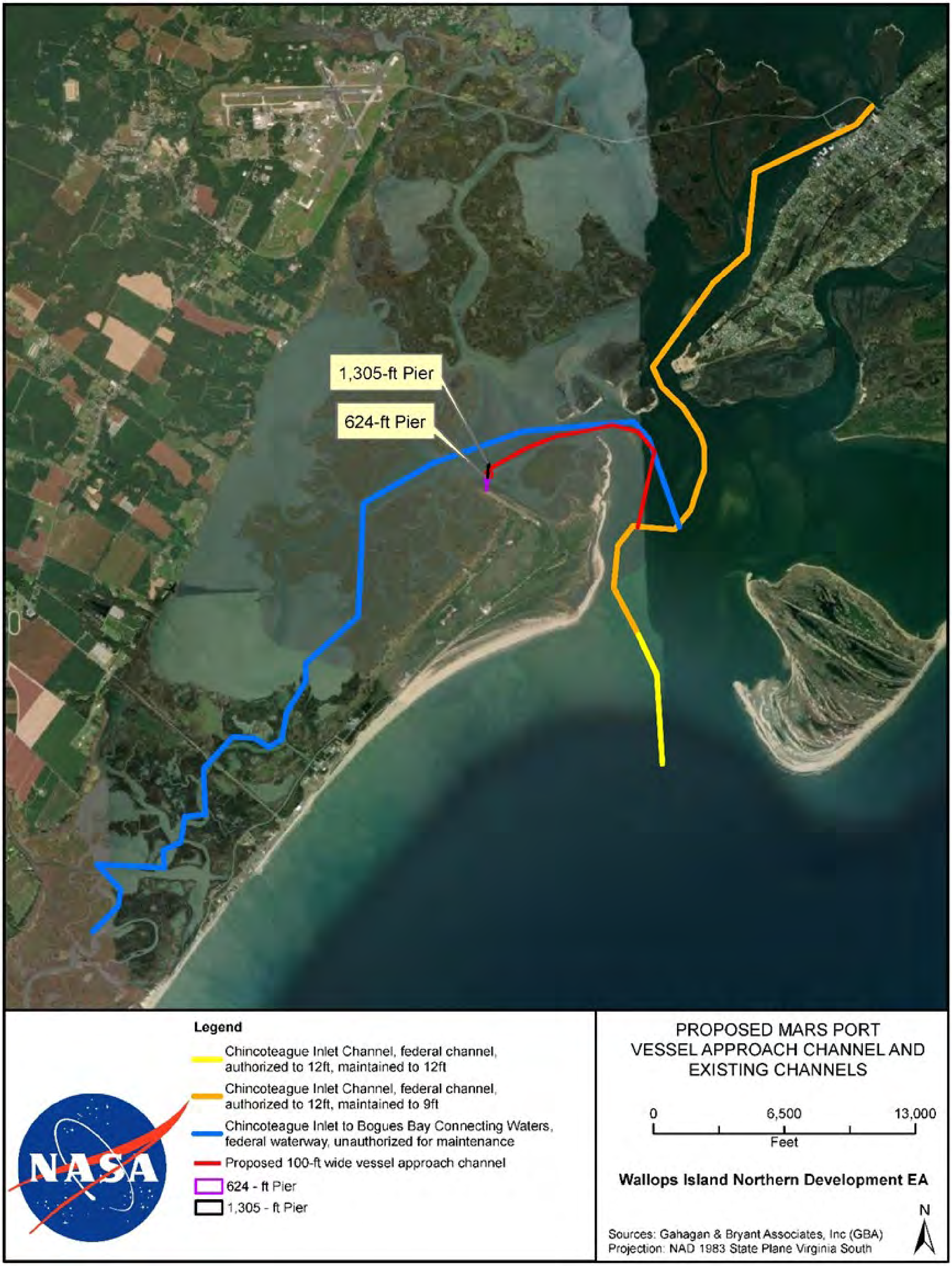

Figure 3: Proposed MARS Port Vessel Approach Channel and Existing Channels

Proposed Action In-Water Components

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. The MARS Port would provide a port and operations area along with associated capabilities for MARS, NASA WFF, and other customers. The MARS Port would also serve as a new part of the MARAD M-95 Marine Highway Corridor. The Proposed Action would be constructed in phases, which would be driven by customer need and would ultimately be tied to funding.

The Proposed Action would also include the dredging of an existing channel for enhanced vessel approach purposes. The vessel approach channel, which would interface with both the Chincoteague Inlet Federal Channel and the Bogues Bay connecting waterways, would be used by a variety of manned and unmanned vessels. It would be approximately 3,900 m (12,800 ft) ft long, 30 m (100 ft) wide, and would have a final depth of 3.7 m (12 ft) below MLLW.

Construction of the Proposed Action would be carried out in three phases:

- **Phase 1** would be construction of a 190-m (624-ft) 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 in **Figure 4**). The area dredged would total approximately 13.8 ha (34 ac). 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. A 40-m (130-ft) long segment of the access road would be widened from 4.5 m to 9 m (15 ft to 30 ft) in conjunction with the widening of the culvert over which the road crosses a headwater drainage channel to Cow Gut.
- **Phase 2** would be construction of a 206-m (676-ft) 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 4**) to a final depth of 2.7 m (9 ft) below MLLW. The area dredged would total approximately 4 ac.
- **Phase 3** of construction would be additional dredging of the turning basin and vessel approach channel to a final depth of 3.7 m (12 ft) below MLLW, specifically the portion of the channel from the Phase 2 turning basin to where it meets the Chincoteague Inlet Federal Channel (shaded blue on **Figure 4**). The previously dredged area that would be dredged again to increase its depth would total approximately 13.4 hectare (ha) (33 acre [ac]).

Phases for the Proposed Action would be driven by customer need, which would increase operational tempo, and ultimately be tied to available 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 portion of the channel shown in pink on **Figure 4**, 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 2022 and being completed by 2024, 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.

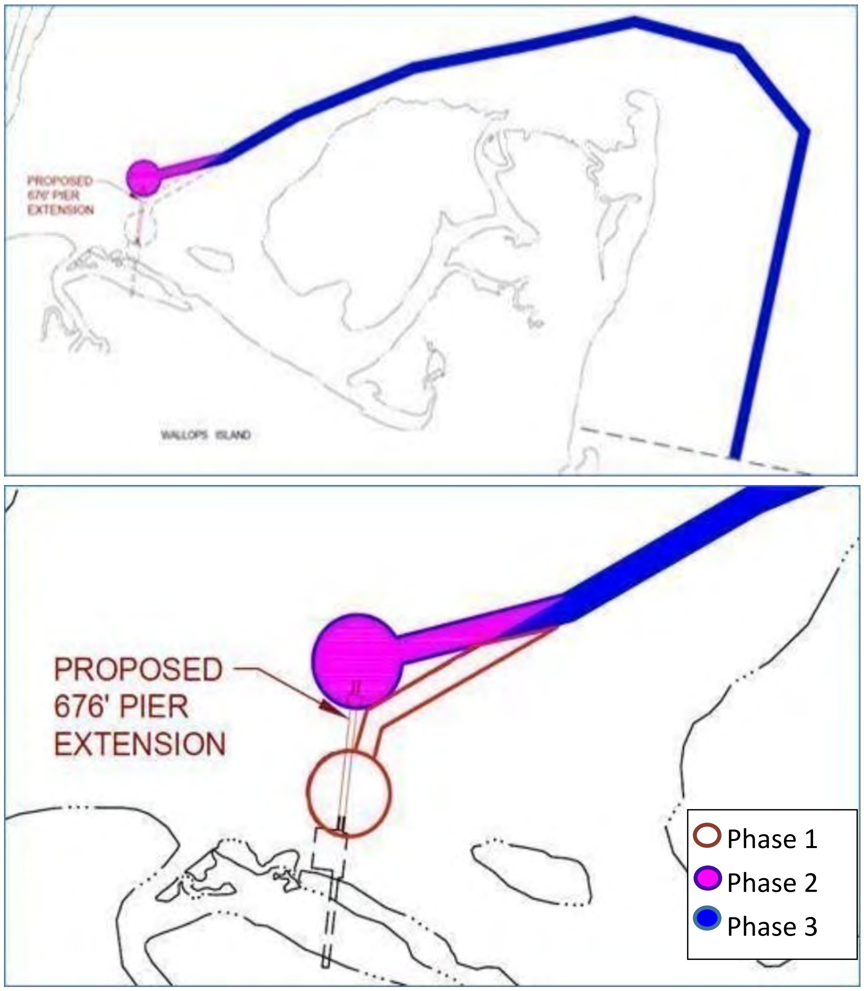

Figure 4: Diagram of Proposed Phased Construction

Typical equipment used during pier 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. Concrete pilings would be installed using a soft-start procedure. The soft-start method involves initially driving the pile with a low hammer energy that is gradually increased to allow fish and other mobile animals (e.g., marine mammals) that may be in the Project Area to detect the presence of noise-producing activities and depart the area before full-power pile-driving begins. The soft-start procedure would not begin until the exclusion zone surrounding the project location is monitored/cleared for the presence of marine mammals and sea turtles.

Figure 5 and **Figure 6** show the preliminary schematics of the Proposed Action pier layout and elevation for Phase 1 and Phase 2, respectively.

A variety of shallow-draft (0.6- to 1.2-m [2- to 4-ft]), manned and unmanned vessels would be serviced by the 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 requiring approximately 2.4 m (8 ft) of draft. Vessels originating from overseas or from the Ports of New York/New Jersey, Norfolk (Virginia), Baltimore (Maryland), Philadelphia (Pennsylvania), or Wilmington (Delaware) would enter the Chincoteague Inlet Federal Channel and the Bogues Bay connecting waterways to the proposed approach channel and turning basin for the pier (**Figure 3**). The proposed width of the approach channel, approximately 30 m (100 ft), is consistent with the dimensions of the Federal Channel. Estimated dredging volumes for the vessel approach channel and turning basin are provided in **Table 1**.

Table 1. Estimated Dredging Volumes

	Phase 1	Phase 2	Phase 3
Channel area (depth below MLLW)	2.7 m (9 ft)	2.7 m (9 ft)	3.6 m (12 ft)
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)**

m^3 = cubic meters, yd^3 = cubic yards

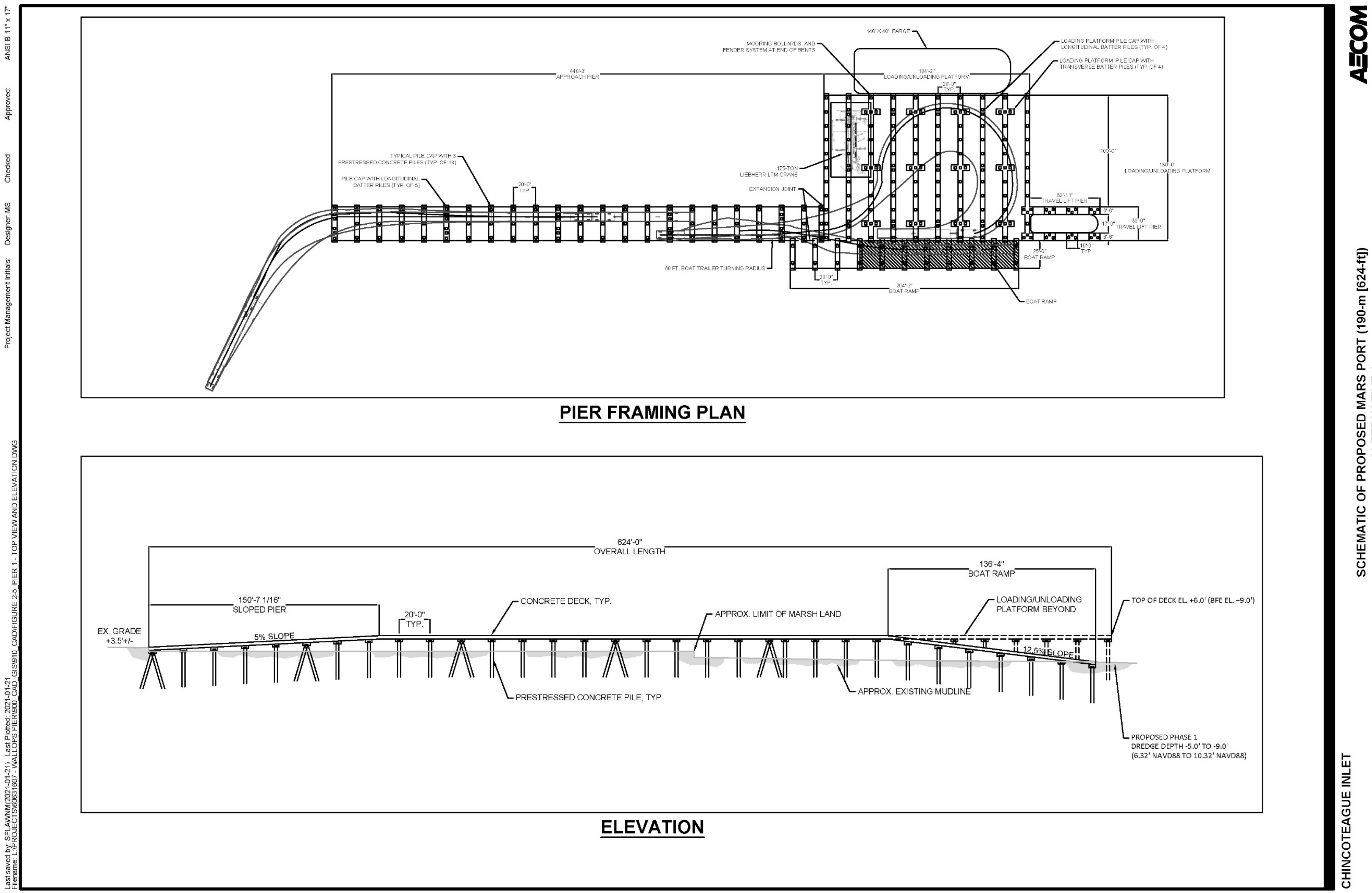

Figure 5: Preliminary Schematic of Proposed MARS Port – Phase 1

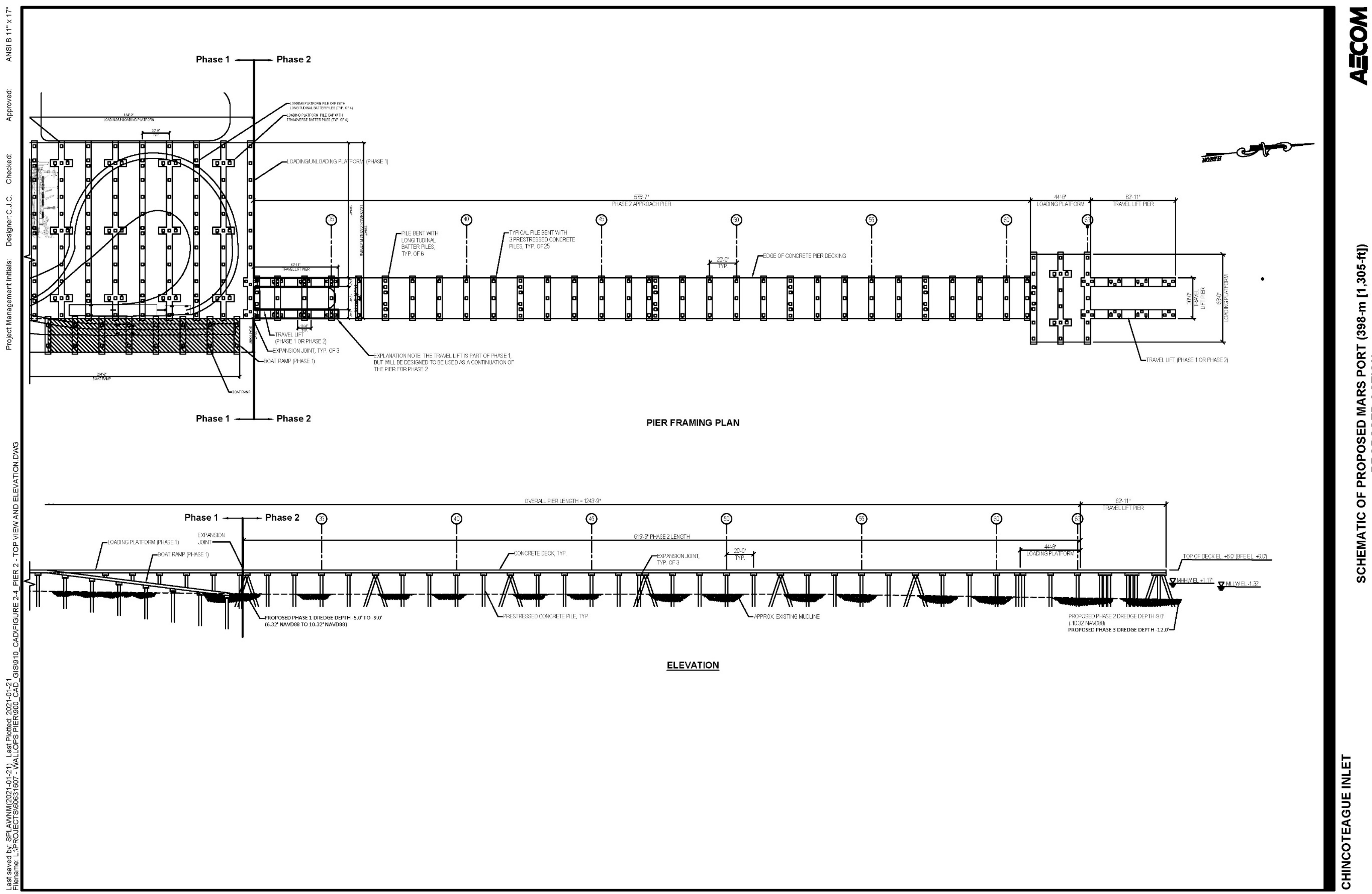

Figure 6: Preliminary Schematic of Proposed MARS Port – Phase 2

Dredged Material Placement Decision

The five potential sites considered for the placement of dredged material are summarized in **Table 2** and shown on **Figure 7**. The Proposed Action (Phases 1, 2, and 3) would result in a total volume of 72,100 m^3 (94,200 yd^3) of dredged material requiring placement. VCSFA intends to utilize Option 4, the Wallops Island Shoreline Protection Placement, as the preferred dredged material placement option. 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 (90%+ 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 composed of approximately 95% sand and, therefore, would be suitable for shoreline renourishment. The geotechnical report for the MARS Port is provided as Attachment 2.

The material dredged during Phase 1 (between 42,000 m^3 and 43,000 m^3 [56,000 yd^3 and 57,000 yd^3]) 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). 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.

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 made using historic dredge records made available by the Norfolk District of the USACE (Attachment 3). It was assumed that the proposed channel could be maintained at a navigable depth of 2.7 m (9 ft) or 3.6 m (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 (Attachment 4) 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 cubic meters per year (m^3/yr) (1,400 to 12,000 cubic yards per year [yd^3/yr]), depending on the depth and location(s) that need to be dredged.

Table 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**	**Description**
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)	--	This area is located just offshore of Wallops Island with a transportation distance of the dredged material of approximately 7.4 km (4 nautical mi). Open water placement options typically present the lowest cost dredging option and allows 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
2	Wallops Island Flood Protection/ Upland Placement	Reuse of material for flood mitigation through upland placement at site identified by NASA	--	850 m (2,800 ft)	--	3,700 m (12,040 ft)	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 crossing 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.

Table 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**	**Description**
3	Greenbackville, VA, 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)	200 m (650 ft)	The third dredged material placement option identified is the use of the upland Dredged Material Containment Facility (DMCF) owned and managed by the USACE. The USACE places material dredged from the upper reaches of the Chincoteague Channel into this DMCF. This option would utilize a mechanical dredge to load the dredged material removed from the approach channel into barges. These barges would then be towed approximately 18.5 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.

Table 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**	**Description**
4	Wallops Island Shoreline Protection Placement	Reuse of material for shoreline protection and beach repair	12.1 km (7.5 mi)	--	9.7 km (6 mi)	--	This option would involve the beneficial reuse of clean, compatible sand from the dredged material to repair and protect areas of the shoreline on Wallops Island. Based on the March 2021 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. The material could 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 7**). 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.

Table 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**	**Description**
T5	Chincoteague National Wildlife Refuge Swan Cove Placement	Reuse of material for habitat restoration	-	9 km (5.6 mi)	-	6.9 km (4.3 mi)	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 with the Swan Cove Pool Restoration Project design criteria, it would be used by 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 under-sized culvert restricting sediment deposition and tidal flow. Although USFWS would prefer material with a high proportion of sand, they would 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. Once pumped, USFWS would assume responsibility for sediment placement and securing appropriate permits.

[1] Sail distance = 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 (statute miles)
[2] Pipe distance = the length of pipe required to reach the placement site from the centroid of dredging or from the anchorage for a vessel loaded with dredged material

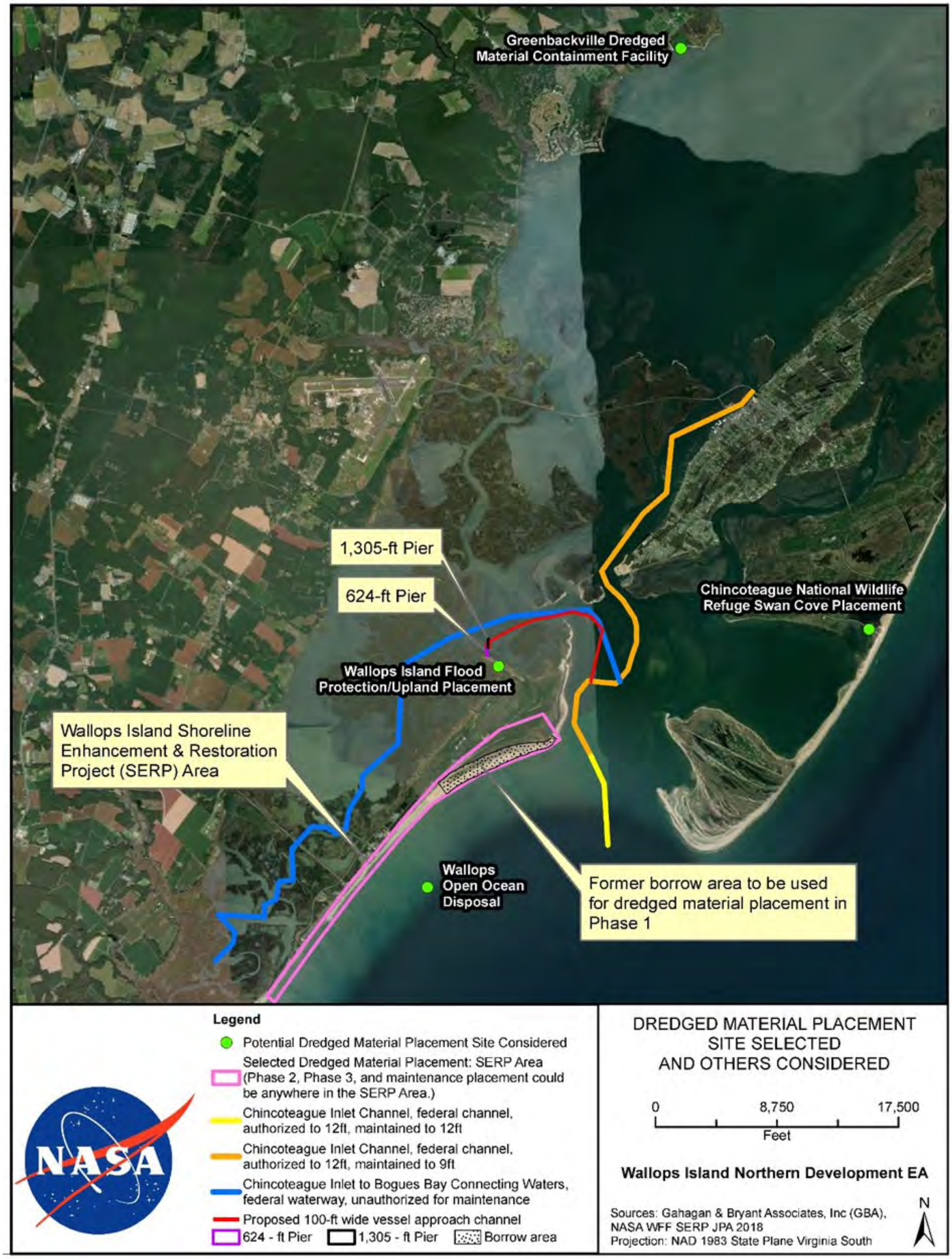

Figure 7: Dredged Material Placement Site Selected and Others Considered

Summary of Proposed Action Construction Activities

Construction of the Proposed Action would involve: (1) construction of onshore and pier components that would make up the MARS Port, (2) mechanical dredging of the vessel approach channel and turning basin, (3) placement of dredged material, and (4) construction or improvement of the proposed onshore facilities and infrastructure.

The estimated timeframe for construction of the Proposed Action would have Phase 1 beginning in 2022 and being completed by 2024, with subsequent phases occurring approximately 1 to 2 years after completion of the prior phase. 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 398 m [1,305 ft]) would take approximately 9.5 months to complete.

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/day, 7 days/week, with two crews each working 12-hour shifts.

In addition to in-water components of the Proposed Action, onshore facilities and infrastructure would be constructed or upgraded, including installation of a temporary wastewater holding tank from which wastewater would be periodically collected and pumped into the NASA wastewater system for treatment. In accordance with the WFF Integrated Contingency Plan, precautions would be taken prior to and during collection from the temporary tank and while pumping into the wastewater collection system. It is assumed that construction of all proposed onshore project components and infrastructure would be completed during Phase 1.

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.

Summary of Wetland Impacts

Three estuarine emergent wetlands and a small tidal stream were delineated within the Project footprint (**Figure 8**). The vegetation of these tidal wetlands is dominated by erect, rooted, herbaceous, usually perennial, species. Dominant species include saltmarsh cordgrass (*Spartina alterniflora*) in the low marsh zone and saltmeadow hay (*Spartina patens*) in the high marsh. USACE preliminary jurisdictional determinations have been received for all wetlands.

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**.

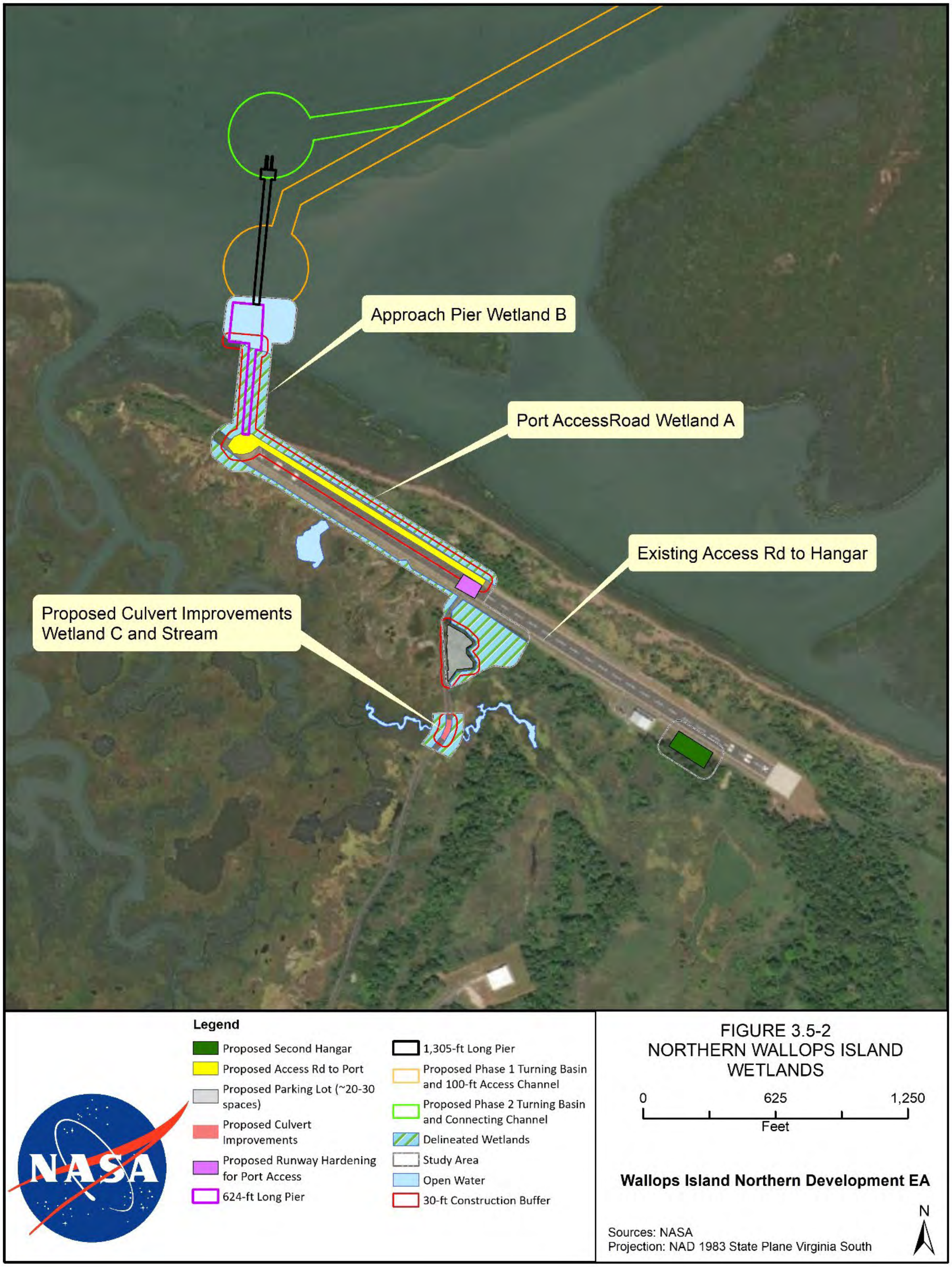

Figure 8: Northern Wallops Island Wetlands

Table 3. Direct Wetland Impacts for the MARS Port			
Impact Area	**Feature**	**Temporary Impact (Hectares / Acres)**	**Permanent Impact (Hectares / Acres)**
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 areas. 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 9-m (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 minimize adverse impacts on wetlands. If soil disturbance impacts wetland areas, the disturbed surfaces would be removed in layers and replaced in the order they are removed such that seeds and roots would remain in the top layer. Layers would be hand smoothed and, once work was completed, any bare areas would be seeded or sprigged with a native mix of species observed at the site; native vegetation would be re-planted within 30 days from the completion of activities. Soils, substrate, and contours of temporarily disturbed wetlands would be restored to pre-construction conditions to the extent practicable.

Specific wetland permits could also include requirements for mitigation and/or monitoring. Mitigation of wetland impacts occurs in the following order: avoidance, minimization, then compensatory mitigation for unavoidable impacts. 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. NASA and VCSFA would conduct construction and post-construction monitoring to identify and document if and when disturbed areas achieve final stabilization as specified in any permits; corrective action measures (e.g., additional grading, vegetation planting) would be implemented such that permit requirements are met.

Summary of Proposed Action Operational Activities

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 fencing. During summer months, a mosquito fogging service truck sprays the airfield once every two weeks. Additionally, the pier structure would require quarterly structural inspections.

Potential usage of the MARS Port facility during its operation is provided in **Table 4**.

Table 4. 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 push boat	1 per 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

Table 4. Potential MARS Port Operations/Facility Usage				
Potential Facility Usage	**Vessel Type**	**Quantity Assumptions**	**Total Barge / Vessel Trips**	**Phase Associated with Usage**
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
Total Barge / Vessel Trips			**99**	

EFH Assessment

The MSA defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity," and it requires federal agencies to consult with NOAA Fisheries when proposing activities that may adversely affect EFH. To facilitate consultation, NOAA Fisheries provides an online mapping tool (the EFH Mapper) that can be queried to identify designated EFH species and life stages potentially occurring near the proposed project area (NOAA Fisheries 2022). Information provided by the EFH Mapper for the action area is included in Attachment 5.

In accordance with the EFH Final Rule published in the *Federal Register* on 17 January 2002, federal agencies may incorporate an EFH assessment into documents prepared for another purpose, such as an EA, provided the EFH assessment is clearly identified as a separate and distinct section of the document. The information presented in this letter is based on the analysis provided in the EA for this Proposed Action as well as the EFH Assessment Worksheet (NOAA Fisheries 2020b) prepared for this consultation (Attachment 1). The four primary elements of the EFH assessment are summarized below:

1. A description of the Proposed Action.

   Provided below; a more detailed description is provided in the EA prepared by NASA for the Proposed Action, in compliance with NEPA.

2. An analysis of the potential adverse effects of the Proposed Action on EFH and the managed species.

Briefly summarized in the EFH Assessment Worksheet (Attachment 1) and discussed in more detail below.

EFH in the Project Area

The Proposed Action includes the construction of a pier and dredging of channels and turning basins in open tidal waters off the north end of Wallops Island. The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR 402.02). For this project, the action area includes the north end of Wallops Island surrounding the UAS airstrip, including the surrounding waters from Chincoteague Inlet to the east and north to Bogues Bay to the west – the offshore areas potentially affected by pier construction, dredging of channels and turning basins, and vessels transiting between the proposed pier and the existing Chincoteague Inlet Federal Channel. As described above, 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 Wallops Island beach in the SERP area (**Figure 5**). The elements of the ongoing SERP activities to protect Wallops Island shoreline infrastructure through beach renourishment are described in detail in the *2019 SERP EA* (NASA 2019c), which includes its own EFH assessment and NOAA Fisheries concurrence.

The Proposed Action area is geographically coincident with EFH for one or more life stages of 11 federally-managed fish species (NOAA Fisheries 2022). These species and life stages are listed in **Table 5**.

Table 5. Species and Life Stages with Designated EFH in Waters of the Action Area

Species	Eggs	Larvae/ Neonates[1]	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*)[2]		X	X	X
Sandbar shark (*Charcharinus plumbeus*)[2]		X	X	
Smoothhound shark complex – Atlantic stock (*Mustelus canis*)[2]		X	X	X
Summer flounder (*Paralicthys dentatus*)			X	X
Windowpane flounder (*Scophthalmus aquosus)*				X
Winter skate (*Leucoraja ocellata*)			X	X

Notes:
1. An "X" indicates that EFH has been designated within the project area for that species and life stage.
2. The three shark species bear live young (neonates) and thus, do not have a free-swimming larval stage.

Source: NOAA Fisheries (2022)

The offshore habitats within the action area include tidal marsh communities and the estuarine surface waters of Chincoteague Inlet, Bogues Bay, Ballast Narrows, and other waterways. The nearest beds of submerged aquatic vegetation are approximately 4.8 km (3 miles) north of the project area.

The benthic invertebrate community of the Project Area may be an important EFH component that provides a food source for managed fish species. 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. 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 considered to be representative of the area that includes the pier and the areas to be dredged for the turning basins and the western end of the approach channel. The benthic samples were collected from subtidal areas at locations ranging from approximately 40 m to 285 m (130 ft to 930 ft) offshore of the tidal marsh. The *Benthic Infauna Community Assessment* (AECOM 2021) completed for the MARS Port is included as Attachment 6.

The six samples collected had a 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 due to 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.

Infaunal organisms identified from the six benthic samples collected were representative of typical estuarine habitat. The six benthic samples had a total of 540 individuals from 34 different taxonomic groups. Some individual organisms were readily identifiable to the species level while others remained at a higher classification to expedite sample analysis while balancing level of taxonomic effort. Annelida (Polychaeta) were the dominant taxonomic group and comprised 55% of the identified individuals. Bivalves were the second most abundant and comprised 26% of the identified individuals. The three polychaete Families Capitellidae, Spionidae Cirratulidae and one mollusk Family Tellinidae were consistently present within the six samples.

The majority of the polychaetes identified were threadlike capitellids and small spinonidae, 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). These two taxa 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 next most abundant taxa were bivalve mollusks (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.

Waters in the Project Area contain public and private harvesting areas for shellfish (oysters and clams). These aquaculture areas are mapped in **Figure 7**. 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 east 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).

Figure 9. Aquaculture Areas Near Wallops Island

Construction and Operations Impacts

A 398-m (1,305-ft) fixed pier would be constructed in the northwest portion of the Project Area that would extend from salt marsh/intertidal habitat through subtidal habitat and into estuarine habitat. A turning basin would be constructed around the pier, impacting estuarine habitat. A vessel approach channel approximately 3,900-m (12,800-ft) long and 30 m (100 ft) wide would be dredged to a final depth of 3.7 m (12 ft) below MLLW in estuarine habitat.

As discussed above and quantified under *Summary of Wetland Impacts*, the salt marsh and estuarine habitat within the footprint of the pilings supporting the pier would be permanently converted. These habitats beneath the pier would be shaded, inhibiting plant growth and reducing the presence of wetland and underwater vegetation that may provide fish habitat. The submerged structure of the pier would provide substrate for colonization by invertebrates and shelter and foraging habitat for fish. Pier construction and channel/basin dredging could result in temporary, localized impacts from increased noise, turbidity, and sedimentation.

Portions of the EFH 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 or associated EFH in those areas.

A small area of EFH would be affected by a proposed improvement to a road. A 40-m (130-ft) segment of the existing paved access road for the UAS airstrip would be widened from 4.5 m to 9 m (15 ft to 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. This proposed construction would result in less than 0.01 ha (<0.01 ac) of impacts to the stream, and would result in temporary turbidity and noise impacts to EFH. 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 within this headwater drainage. Overall, the culvert would have a negligible impact on EFH.

The onshore construction contractor(s) would use erosion and sediment control measures in upland areas to minimize or prevent the erosion of exposed soils by wind and water and corresponding sedimentation of receiving water bodies. Accidental spills of fuel, oil, hydraulic fluid, or other potentially hazardous substances would be prevented or minimized through the contractor’s adherence to project-specific Spill Prevention Control and Countermeasures Plan, good housekeeping, and Best Management Practices (BMPs), as specified in WFF’s *Integrated Contingency Plan*.

A temporary wastewater holding tank would be installed adjacent to a new onshore hangar. Wastewater would be periodically collected and pumped into the NASA wastewater system for treatment. Impact to nearby EFH, would be prevented or minimized through the contractor’s adherence to spill prevention and control measures, as specified in WFF’s *Integrated Contingency*

Plan, prior to and during collection from the temporary tank and while pumping into the wastewater collection system.

Dredging Impacts

The benthic community and associated EFH would be disturbed in the vicinity of the proposed pier and dredging of turning basins and channels. 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. In Phase 3, previously dredged areas would be re-dredged to increase their depth. Thus, the maximum area of bottom to be directly removed by dredging through all construction 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 (35.5 ac).

As discussed above, maintenance dredging of the basin and channel would be repeated periodically as necessary to maintain the required depth. Estimates of future maintenance dredging requirements have been made using historic dredge records, indicating that future dredging events could range from every 3 to 6 years with annualized dredge volumes ranging from 1,100 m^3/yr to 9,200 m^3/yr (1,400 yd^3/yr to 12,000 yd^3/yr), depending on the depth and location(s) that need to be dredged.

Dredging impacts to fish and benthic invertebrate prey would occur from direct entrainment (being captured by the dredge bucket). Eggs, larval stages, and sessile or sedentary prey species typically are the most susceptible to entrainment. Entrainment rates for the proposed clamshell bucket dredging tend to be lower and less problematic than in continuous cutter/suction dredging. Nevertheless, some fish species can be captured in clamshell 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).

Dredging and pile-driving during construction of the Proposed Action and maintenance dredging during operation of the pier facility would resuspend sediment in the water column and produce turbidity due to suspended particles and subsequent sedimentation. Generally, high levels of suspended solids and long exposure times produce the greatest mortality. Decreased visibility from increased turbidity 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). Temporary turbidity and sedimentation effects from dredging along the channel and basin may impact nearby privately leased oyster beds (aquaculture).

During channel and turning basin dredging, sediment disturbance and total suspended solids (TSS) concentrations could vary greatly depending on factors such as the equipment used, currents, and tides. Mechanical dredges would be used (e.g., clamshell). TSS concentrations associated with clamshell bucket dredging operations have been found to range from 105 milligrams per liter (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 approximately 150, 300, 610, and 1,000 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, USACE conducted extensive monitoring of mechanical dredge plumes and found that plumes dissipated to background levels within 180 m (600 ft) of the source in the upper water column and 730 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 730-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 2020)

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. Relatively immobile fish larvae or benthic invertebrate prey could be adversely impacted if extended periods of low dissolved oxygen occur.

Adverse impacts on shellfish from turbidity and sedimentation are unlikely, as the dredging activity would be short in duration and would not cover a large area of shellfish habitat. Additionally, increases in turbidity from dredging are generally similar to those that occur during strong storm events and estuarine organisms have adapted to a wide range of turbidities (NOAA Fisheries 2020b).

It is expected that there would be minor, temporary impacts on benthic invertebrate prey within the area of dredging and pile-driving activities as a result of turbidity, sediment deposition, and re-suspension of anoxic sediments. As discussed above, 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. Additionally, water quality conditions would return to a pre-disturbance state 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. 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 that may be prey for managed fish species. (NOAA Fisheries 2020b).

The sandy, dredged material is anticipated to settle quickly; 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 beyond the immediate project area. The use of turbidity curtains around the pier construction area and the basin and access channel dredging areas could reduce or eliminate the potential impacts from sediments that may be released at the point of construction. 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 tides and the eastern portion of the channel during ebb tides.) Thus, the areas of EFH that would be affected by turbidity from the Proposed Action would be minimized, and effects on EFH that may occur in the Project Area would be of short duration.

Noise Impacts

Ambient noise levels would increase near construction and dredging locations. Some fish and invertebrate prey may be directly affected through their avoidance of noise. Abundance of prey species may also be altered temporarily within the Project Area as prey species migrate away from the construction and dredging activities. Noise effects on aquatic species would be temporary and would occur during limited periods while the equipment is being operated. However, impacts would be temporary and confined to EFH in the immediate vicinity of activities in Ballast Narrows and Chincoteague Inlet.

3. Conclusions regarding the effects of the Proposed Action on EFH.
    - Provided in the EFH Assessment Worksheet (**Attachment 1**) and briefly summarized as follows: NASA has determined that potential adverse effects on EFH from the Proposed Action would be minimal and temporary. The overall determination is that adverse effects on EFH would not be substantial.
4. Proposed mitigation measures.
    - In accordance with wetland permitting requirements, wetland mitigation may be required to compensate for impacts to tidal marsh within the footprint of the proposed pier. The summary of wetland impact above describes the areal extent of temporary and permanent wetland impacts and the potential mitigation that may be required.
    - NASA would implement BMPs, described above, to minimize temporary adverse effects, which are briefly summarized as follows:
        - Impacts from sedimentation and erosion would be prevented or minimized through BMPs, which could include turbidity curtains, silt fence, and/or other approved measures to control erosion, turbidity, and sedimentation.
        - If the use of turbidity curtains is not possible, dredging would be conducted during slack tides (i.e., on the western portion of the channel during flood tides and the eastern portion of the channel during ebb tides.)
        - NASA would employ spill prevention measures, as detailed in WFF's *Integrated Contingency Plan* and project-specific Spill Prevention Control and Countermeasure Plan.
        - Revegetation of areas in the salt marsh using onsite excavated plant material disturbed by construction or materials staging, or new sprigging would further minimize potential adverse effects on EFH.

Conclusions

Based on this assessment, NASA has determined that the effects of the Proposed Action on EFH would not be substantial. I certify that we have used the best scientific and commercial data available to complete this assessment and request your concurrence with this determination.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Sincerely,

Shari A. Miller
Center NEPA Manager and
Environmental Planning Lead

Enclosures:
Attachment 1: EFH Assessment Worksheet
Attachment 2: Geotechnical Report for MARS Port
Attachment 3: Dredging Estimates Memorandum
Attachment 4: Bathymetry Information
Attachment 5: EFH Mapper and Species List
Attachment 6: Benthic Community Assessment

cc:
250/Ms. K. Finch
250/Mr. T. Meyer
MARAD/Mr. A. Finio
NMFS/Mr. D. O’Brien
NMFS/Mr. B. Hopper
USACE/Mr. S. Bahnson
VCSFA/Mr. A. Brittingham

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ATTACHMENT 1: EFH WORKSHEET

EFH Mapper Report

EFH Data Notice

Essential Fish Habitat (EFH) is defined by textual descriptions contained in the fishery management plans developed by the regional fishery management councils. In most cases mapping data can not fully represent the complexity of the habitats that make up EFH. This report should be used for general interest queries only and should not be interpreted as a definitive evaluation of EFH at this location. A location-specific evaluation of EFH for any official purposes must be performed by a regional expert. Please refer to the following links for the appropriate regional resources.

Greater Atlantic Regional Office
Atlantic Highly Migratory Species Management Division

Query Results

Degrees, Minutes, Seconds: Latitude = 37º 53' 28" N, Longitude = 76º 33' 36" W
Decimal Degrees: Latitude = 37.891, Longitude = -75.440

The query location intersects with spatial data representing EFH and/or HAPCs for the following species/management units.

*** W A R N I N G ***

Please note under "Life Stage(s) Found at Location" the category "ALL" indicates that all life stages of that species share the same map and are designated at the queried location.

EFH

Link	Data Caveats	Species/Management Unit	Lifestage(s) Found at Location	Management Council	FMP
		Atlantic Herring	Adult	New England	Amendment 3 to the Atlantic Herring FMP
		Windowpane Flounder	Adult	New England	Amendment 14 to the Northeast Multispecies FMP
		Winter Skate	Adult Juvenile	New England	Amendment 2 to the Northeast Skate Complex FMP
		Clearnose Skate	Adult Juvenile	New England	Amendment 2 to the Northeast Skate Complex FMP
		Sandbar Shark	Juvenile Neonate	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
		Smoothhound Shark Complex (Atlantic Stock)	ALL	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
		Sand Tiger Shark	Neonate/Juvenile Adult	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
		Bluefish	Adult Juvenile	Mid-Atlantic	Bluefish
		Atlantic Butterfish	Adult Juvenile	Mid-Atlantic	Atlantic Mackerel, Squid,& Butterfish Amendment 11
		Summer Flounder	Juvenile Adult	Mid-Atlantic	Summer Flounder, Scup, Black Sea Bass
		Black Sea Bass	Juvenile Adult	Mid-Atlantic	Summer Flounder, Scup, Black Sea Bass

Salmon EFH

No Pacific Salmon Essential Fish Habitat (EFH) were identified at the report location.

HAPCs

Link	Data Caveats	HAPC Name	Management Council

Link	Data Caveats	HAPC Name	Management Council
⚠	?	Summer Flounder	Mid-Atlantic

EFH Areas Protected from Fishing

No EFH Areas Protected from Fishing (EFHA) were identified at the report location.

Spatial data does not currently exist for all the managed species in this area. The following is a list of species or management units for which there is no spatial data. ****For links to all EFH text descriptions see the complete data inventory: open data inventory -->**
All spatial data is currently available for the Mid-Atlantic and New England councils, **Secretarial EFH**, Bigeye Sand Tiger Shark, Bigeye Sixgill Shark, Caribbean Sharpnose Shark, Galapagos Shark, Narrowtooth Shark, Sevengill Shark, Sixgill Shark, Smooth Hammerhead Shark, Smalltail Shark

EFH Mapper Report

EFH Data Notice

Essential Fish Habitat (EFH) is defined by textual descriptions contained in the fishery management plans developed by the regional fishery management councils. In most cases mapping data can not fully represent the complexity of the habitats that make up EFH. This report should be used for general interest queries only and should not be interpreted as a definitive evaluation of EFH at this location. A location-specific evaluation of EFH for any official purposes must be performed by a regional expert. Please refer to the following links for the appropriate regional resources.

Greater Atlantic Regional Office
Atlantic Highly Migratory Species Management Division

Query Results

Degrees, Minutes, Seconds: Latitude = 37º 52' 55" N, Longitude = 76º 33' 38" W
Decimal Degrees: Latitude = 37.882, Longitude = -75.439

The query location intersects with spatial data representing EFH and/or HAPCs for the following species/management units.

***** W A R N I N G *****

Please note under "Life Stage(s) Found at Location" the category "ALL" indicates that all life stages of that species share the same map and are designated at the queried location.

EFH

Link	Data Caveats	Species/Management Unit	Lifestage(s) Found at Location	Management Council	FMP
		Atlantic Herring	Adult	New England	Amendment 3 to the Atlantic Herring FMP
		Windowpane Flounder	Adult	New England	Amendment 14 to the Northeast Multispecies FMP
		Winter Skate	Adult Juvenile	New England	Amendment 2 to the Northeast Skate Complex FMP
		Clearnose Skate	Adult Juvenile	New England	Amendment 2 to the Northeast Skate Complex FMP
		Bluefish	Adult Juvenile	Mid-Atlantic	Bluefish
		Atlantic Butterfish	Adult	Mid-Atlantic	Atlantic Mackerel, Squid,& Butterfish Amendment 11
		Summer Flounder	Juvenile Adult	Mid-Atlantic	Summer Flounder, Scup, Black Sea Bass
		Black Sea Bass	Juvenile Adult	Mid-Atlantic	Summer Flounder, Scup, Black Sea Bass

Salmon EFH

No Pacific Salmon Essential Fish Habitat (EFH) were identified at the report location.

HAPCs

No Habitat Areas of Particular Concern (HAPC) were identified at the report location.

EFH Areas Protected from Fishing

No EFH Areas Protected from Fishing (EFHA) were identified at the report location.

Spatial data does not currently exist for all the managed species in this area. The following is a list of species or management units for which there is no spatial data. ****For links to all EFH text descriptions see the complete data inventory: open data inventory -->**
All spatial data is currently available for the Mid-Atlantic and New England councils, **Secretarial EFH**, Bigeye Sand Tiger Shark, Bigeye Sixgill Shark, Caribbean Sharpnose Shark, Galapagos Shark, Narrowtooth Shark, Sevengill Shark, Sixgill Shark, Smooth Hammerhead Shark, Smalltail Shark

ATTACHMENT 2: GEOTECHNICAL REPORT

HYNES

JOHN D. HYNES & ASSOCIATES, INC.

Geotechnical and Environmental Consultants
Monitoring Well Installation
Construction Inspection and Materials Testing

March 31, 2021

William A. Murchison
Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland 21237

Re: Report of Subsurface Exploration and Geotechnical Consulting Services
Wallops Island M95 Intermodal Barge Service Project
Wallops Island, Virginia
Project No.: JDH-10/20/145

Dear Mr. Murchison:

John D. Hynes & Associates, Inc. has completed the authorized subsurface exploration and geotechnical engineering evaluations for the proposed Wallops Island M95 Intermodal Barge Service project located in Wallops Island, Virginia. Our services were performed, generally, in accordance with our contract dated September 12, 2019.

This report describes the exploration methods employed, exhibits the data obtained, and presents our evaluations and recommendations with regard to dock pile foundations. The report includes a discussion of the field work, the soil and groundwater conditions encountered during the exploration for the dredging and deepening of the proposed Wallops channel and turning basin and the construction of barge deck. The barge deck is to be supported on deck pier bents and pier bents are supported on pier bent pile foundations. We provide recommendations for vertical and battered piles for pier bent pile foundations for the proposed Wallops Island M95 Intermodal Barge Service project.

We appreciate the opportunity to be of service to you. If you have any questions regarding the contents of this report or if we may be of further assistance, please contact our office.

Respectfully,
JOHN D. HYNES & ASSOCIATES, INC.

Duowen Ding
Project Engineer

John D. Hynes, P.E.
President

DD: JDH/jsl

HYNES

REPORT OF SUBSURFACE EXPLORATION AND GEOTECHNICAL CONSULTING SERVICES

WALLOPS ISLAND M95 INTERMODAL BARGE SERVICE PROJECT
WALLOPS ISLAND, VIRGINIA

PREPARED FOR
GAHAGAN & BRYANT ASSOCIATES, INC.

MARCH 31, 2021
PROJECT NO.: JDH-10/20/145

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Email: jdh@jdhynesinc.com

HYNES

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PURPOSE AND SCOPE

The subsurface exploration study was performed to evaluate the subsurface conditions with respect to the following:

1. Soil and groundwater conditions encountered at the site;
2. Channel deepening and dredging;
3. Pier bent pile foundation capacities and installation depths;
4. Pile foundation construction and inspection procedures;
5. Location of groundwater and Chincoteague Bay water; and
6. Other aspects of the design and construction for the proposed structures indicated by the exploration.

An evaluation of the site is included. The inspection is considered necessary both to confirm the subsurface conditions and to verify that the soils related construction phases are performed properly.

EXISTING SITE CONDITIONS

As shown on the Project Location Map (Drawing JDH-10/20/145-A) in the Appendix, the project site is located at the Wallops Island, Virginia. The site includes an on land side area, a marsh area and a water side (mud and overdredge) area. The on land side area is beyond the end of the pavement/runway at the edge of the marsh. The marsh area is generally surrounded by the runway and Chincoteague Bay water. The water side area is along the water channel and turning basin in the Chincoteague Bay. The site includes on land side, marsh, water side areas and is generally along the shoreline of Chincoteague Bay water and Wallops Island.

PROJECT CHARACTERISTICS

Proposed for development on the site is the construction of Wallops Island M95 Intermodal barge service waterfront facilities. Hynes & Associates evaluated the site for the deck foundations. The deck will be supported on bents which are, in turn, supported on pile foundations. Based on information provided by the WBCM, LLC, we understand that the maximum compression load of 140 tons and the maximum uplift load of 90 tons will be considered in the pile analyses. Piles considered for support are 24 inches square prestressed concrete piles and 20 inches square prestressed concrete piles. We understand that the Phase 1 mudline depth at Boring P-3 is -10.3 NAVD88. The Phase 3 mudline depth at Boring P-5 is -13.3 NAVD88. We have evaluated 24 inch and 20 inch square vertical and battered piles to support the pier bent deck. We will provide recommendations for alternative foundations, upon request.

FIELD EXPLORATION AND STUDY

In order to determine the nature of the subsurface conditions at the site, sixteen (16) test borings, designated as L-1, P-1 through P-5, D-2, D-4, D-6, D-9, D-11, D-13, D-15, E-2, E-4, and E-7, were drilled on November 13, 2020 to January 5, 2021, at the approximate locations shown on the Exploration Location Plan (Drawing JDH-10/20/145-B) in the Appendix. Land test boring L-1 was drilled to a depth of 90.5 feet below existing grade. Pier test borings P-1 through P-5 were drilled to depths of 90.5 to 120.5 feet below existing grade. Channel deepening test borings D-2, D-4, D-6, D-9, D-11, D-13, and D-15 were drilled to depths of 4 to 18 feet below existing grade. Dredging test borings E-2, E-4 and E-7 were drilled to depths of 8 feet below existing grade. The test borings were drilled using track-mounted Geoprobe 3230 and 7822 DT drill rigs, and a Mobile B-47 HD drill rig.

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Soil sampling and testing were carried out in accordance with ASTM Specification D-1586. A brief description of the field procedures is included in the Appendix. The results of all boring and sampling operations are shown on the boring log in the Appendix.

Samples of the subsurface soils were examined by our engineering staff and were visually classified in accordance with the Unified Soil Classification System (USCS) and ASTM Specification D-2488. The estimated USCS symbols appear on the boring log and a key to the system nomenclature is provided in the Appendix of this report. Also included are reference sheets which define the terms and symbols used on the boring log and explain the Standard Penetration Test procedures.

We note that the test boring records represent our interpretation of the field data based on visual examination and selected soil classification tests. Indicated interfaces between materials may be gradual.

The field exploration data was supplemented with laboratory testing data. The laboratory at John D. Hynes & Associates, Inc. performed six (6) moisture content tests, fourteen (14) particle size distribution tests including ten (10) hydrometer tests, and eleven (11) Atterberg limits test. The test results are presented in a table in the Appendix.

We collected two Shelby tubes in a soft cohesive soil layers. A third Shelby Tube was attempted at 32 to 34 feet in Boring P-4. The sampling retrieved in no recovery. Two tube samples was sent to EBA Engineering in Laurel, Maryland for unconfined compressive strength testing, unit weight determination, moisture content testing, and Atterberg Limits testing. The samples were taken at 22 to 24 in Boring L-1 and 42 to 44 in Boring P-5. The Shelby tube sample L-1 from Boring L-1 at depths 22 to 24 feet was very soft and could not stand properly to be tested. So, EBA could not perform UU-triaxial test on the Shelby tube sample L-1. EBA performed the other tests on the Shelby tube sample L-1 except the UU-triaxial test. Shelby tube test results and sample identifications, locations and depths are included in the Appendix. The EBA Engineering data sheets are included in the Appendix.

Six pressuremeter tests were performed by In-Situ Soil Testing, L.C. in the field at locations P-2 and P-2A. The test at 12.9 feet at B-2 was rerun at B-2A at 14 feet because the data was in question. The data was verified. The results of this testing are included in the Appendix of this report.

SUBSURFACE CONDITIONS

At the time of our field work, 6 inches of organic bearing soil was encountered at the ground surface at the boring location L-1. Sediments were encountered at the other boring locations. Varying thicknesses of organic bearing soils or other surficial materials in varying thicknesses may be encountered at other locations on site.

The soils encountered were visually classified in accordance with the USCS and consisted of interbedded layers of SAND (SP and SP-SM), Silty SAND (SM), Clayey SILT (ML and ML-MH), Clayey Elastic SILT (MH), Clayey Organic SILT (MH-OH), CLAY and SAND (CL-SC), CLAY (CL), Silty CLAY and Fat CLAY (CL-CH), and Silty Fat CLAY (CH) to the boring termination depths. Standard Penetration Test (SPT) values (N-values) in the sand layers ranged from 2 to 47 blows per foot, indicating in-place relative densities of very loose to dense. The SPT values in the cohesive soil layers ranged from 3 to more than 91 blows per foot, indicating in-place consistencies of very soft to hard.

Groundwater was encountered at depths of 3 feet below the ground surface during drilling operations at Boring L-1. Groundwater elevations may vary at other times during the year depending upon the amount of local precipitation, tidal fluctuations in the Chincoteague Bay at boring L-1. The water level in the Bay was at grade in boring P-1 at the

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time the boring was drilled. Water depths varied from 2.25 feet to 16 feet in the other test borings that were drilled from a barge.

RECOMMENDATIONS

The following recommendations and considerations are based on our understanding of the proposed construction, the data obtained from the exploration, and our previous experience with similar subsurface conditions and projects. If there are any significant changes to the project characteristics, such as structural loadings differing significantly from those noted above, structure geometry, structure location, foundation type, elevations, etc., we request that this office be advised so the recommendations of this report can be re-evaluated.

A. Turning Basin and Channel Deepening and Dredging

Deepening and dredging for the construction of the proposed channel and turning basin will be required. Based on boring information, it is anticipated that the depth of deepening and dredging in earth materials will likely be up to 8 to 18 feet deep. The materials that will be encountered in the deepening and dredging include SAND (SP and SP-SM), and CLAY and SAND (CL-SC) materials. Standard Penetration Test (SPT) values (N-values) in the sand layers ranged from 3 to 37 blows per foot, indicating in-place relative densities of very loose to dense. It is anticipated that earth deepening and dredging can generally be performed using conventional deepening and dredging equipment in proper working condition.

B. Driven Prestressed Concrete Piles

Based on the proposed loads and subsurface soil conditions at the site, we recommend supporting the deck pier bents on prestressed concrete pile foundations. Hynes & Associates' pile recommendations are based upon local site characteristics, the subsurface soil parameters determined from the field exploration, pressuremeter test results and the physical characteristics of the piles. We provide recommendations for 24 inch square and 20 inch square prestressed concrete piles. Assuming conformance to the embedment requirements, the assigned pile capacities may be used by the Structural Engineer for pile spacing according to the structure design and the loads to be applied. Total elastic settlement of the piles is anticipated to be less than ½ inch. Considering the subsurface soil characteristics and the parameters used in our assignment of pile embedments, long term settlement of the pile foundations is expected to be minimal if the recommendations of this report are followed. The pile properties are shown in the Appendix (Drawing JDH-10/20/145-D. We understand that the Phase 1 mudline depth at Boring P-3 is -10.3 NAVD88. The Phase 3 mudline depth at Boring P-5 is -13.3 NAVD88.

Based upon the above, we will provide pile embedments and allowable capacities of prestressed concrete piles with square sections, dimensions of 24 in. by 24 in. and 20 in. by 20 in. the land side area, marsh and water areas. The pile capacities will be presented in a supplement to this report.

The compression design capacity of each prestressed concrete pile production pile should be confirmed by the geotechnical engineer or an experienced pile inspector during the pile driving operations by using an acceptable pile driving formula such as the Engineering News Formula. In instances where the design capacity cannot be obtained within the production pile lengths, additional piles would be required.

The characteristics of the prestressed concrete pile groups should be designed for adequate structural requirements as specified by the Structural Engineer. These requirements should include the strengh of the piles under static, dynamic, uplift and lateral loads, where applicable.

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The installation of all piles should be in accordance with local code requirements. In addition, the installation of all piles should be inspected by a qualified Geotechnical Engineer or foundation inspector. The inspector should verify and record all aspects of the installation including pile sizes, pile length before driving, cut-off length, tip installation depth and the driving data.

We recommend that at least one pile load test be performed for each capacity of vertical pile at locations as decided by the Structural and Geotechnical Engineers. The pile load test should be in accordance with ASTM D-1143 Standard Test Method for Piles Under Static Axial Compressive Load. The piles should be loaded to 200 percent of the design load. The load tests should be required to verify the capacity of the piles at the selected embedment depth and capacity. As an alternative, Dynamic Pile Load testing may be performed.

ADDITIONAL SERVICES RECOMMENDED

Additional engineering, testing and consulting services recommended for this project are summarized below.

Driven Pile Inspections

The Geotechnical Engineer should verify all driven length embedments. The geotechnical engineer or experienced foundation inspector should verify and record all aspects of installation including pile dimensions, pile length, tip elevation, top elevation and the driving data. The inspecting engineer should verify that the driving data indicates that the design compression, uplift, and lateral capacity of each pile had been achieved.

REMARKS

This report has been prepared solely and exclusively for Gahagan & Bryant Associates, Inc. to provide guidance to design professionals in developing facilities plans for the proposed Wallops Island M95 Intermodal Barge Service Project located in Wallops Island, Virginia. It has not been developed to meet the needs of others, and application of this report for other than its intended purpose could result in substantial difficulties. The Consulting Engineer cannot be held accountable for any problems which occur due to the application of this report to other than its intended purpose.

These analyses and recommendations are, of necessity, based on the concepts made available to us at the time of the writing of this report, and on-site conditions, surface and subsurface that existed at the time the exploratory borings were drilled. Further assumption has been made that the limited exploratory borings, in relation both to the areal extent of the site and to depth, are representative of conditions across the site. It is also recommended that we be given the opportunity to review all plans for the project in order to comment on the interaction of soil conditions as described herein and the design requirements.

Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with generally accepted engineering principles and practices.

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APPENDIX

1. Investigative Procedures
2. Project Location Map
3. Boring Location Plan
4. Proposed Pier Plan and Elevation
5. Pile Properties Sketch
6. Boring Logs
7. Hynes & Associates: Grain Size Distribution Graphs
8. EBA: Soil Testing
9. Pressuremeter Test Results
10. Unified Soil Classification Sheet
11. Field Classification Sheet
12. Important Information Sheet

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INVESTIGATIVE PROCEDURES

SOIL TEST BORINGS

Soil drilling and sampling operations were performed in accordance with ASTM Specification D-1586. The borings were advanced by mechanically turning continuous hollow stem auger flights into the ground. At regular intervals, samples were obtained with a standard 1.4 inch I.D., 2.0 inch O.D. splitspoon sampler. The sampler was first seated 6 inches to penetrate any loose cuttings and then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot is the "Standard Penetration Resistance". The penetration resistance, when properly evaluated, is an index to the soil's strength, density and behavior under applied loads. The soil descriptions and penetration resistances for each boring are presented on the Test Boring Records in the Appendix.

SOIL CLASSIFICATION

Soil classifications provide a general guide to the engineering properties of various soil types and enable the engineer to apply his past experience to current problems. In our investigation, jar samples obtained during drilling operations are examined in our laboratory and visually classified by the geotechnical engineer in accordance with ASTM Specification D-2488. The soils are classified according to the Unified Classification System (ASTM D-2487). Each of these classification systems and the in-place physical soil properties provides an index for estimating the soil's behavior.

SIEVE ANALYSIS

Gradational analysis tests were performed to determine the particle size and distribution of the samples tested. The grain size distribution of soils coarser than a No. 200 sieve is determined by passing the sample through a standard set of nested sieves. The percentage of materials passing the No. 200 sieve is determined by washing the material over a No. 200 sieve. These tests are in accordance with ASTM D-421, D-422 and D-1140. The results are presented in the Appendix to our report.

NATURAL MOISTURE

Portions from representative soil samples obtained during drilling operations were selected for Natural Moisture Content tests. The Natural Moisture Content Test determines the water content of soils by drying into an oven with a standard drying temperature of 110°C. The lost of mass drying the sample, determines the water content into the soil. The water content of the sample is calculated in percentage. The water content of soils (natural moisture) is determined in accordance with ASTM Specification D-2216.

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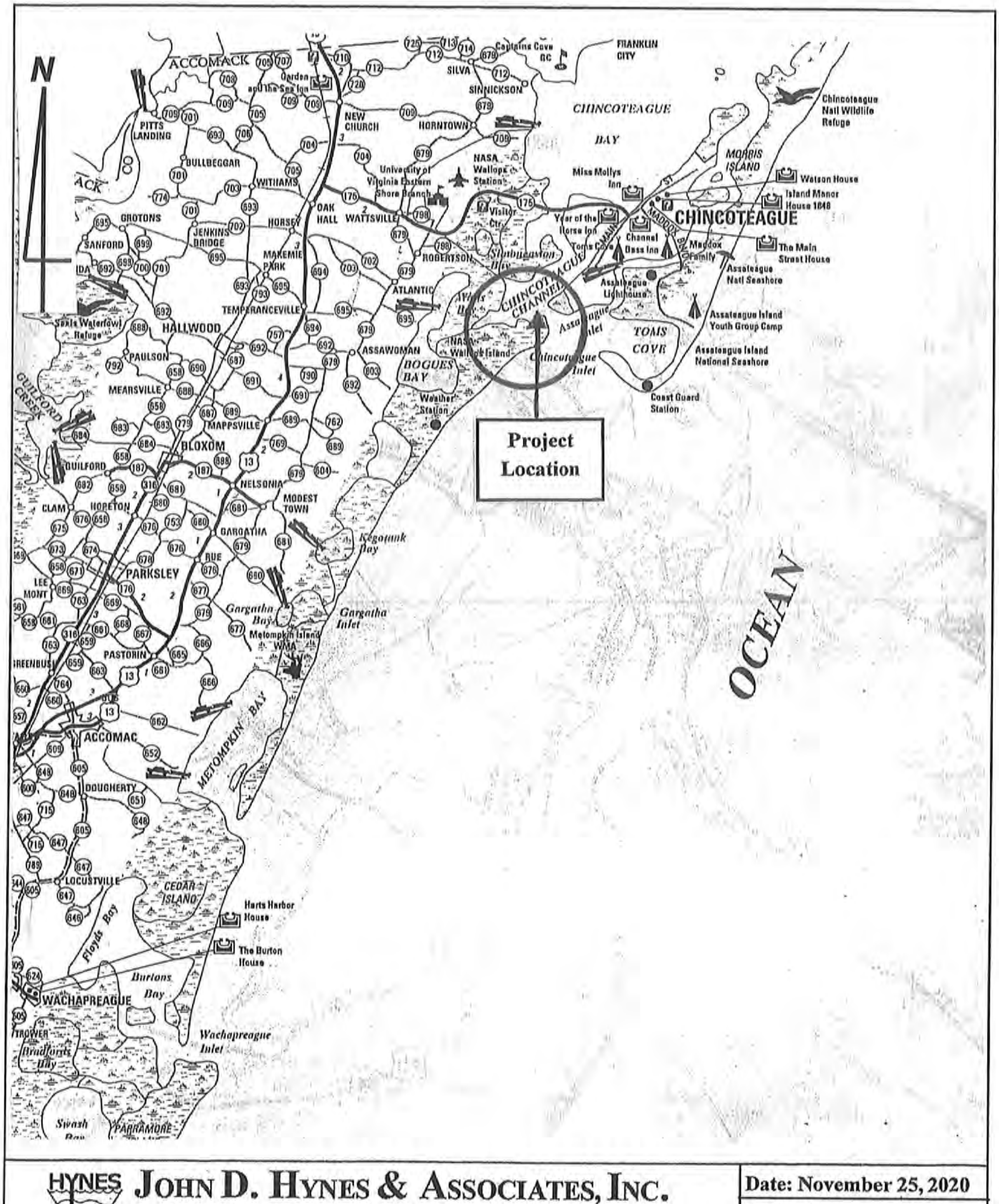

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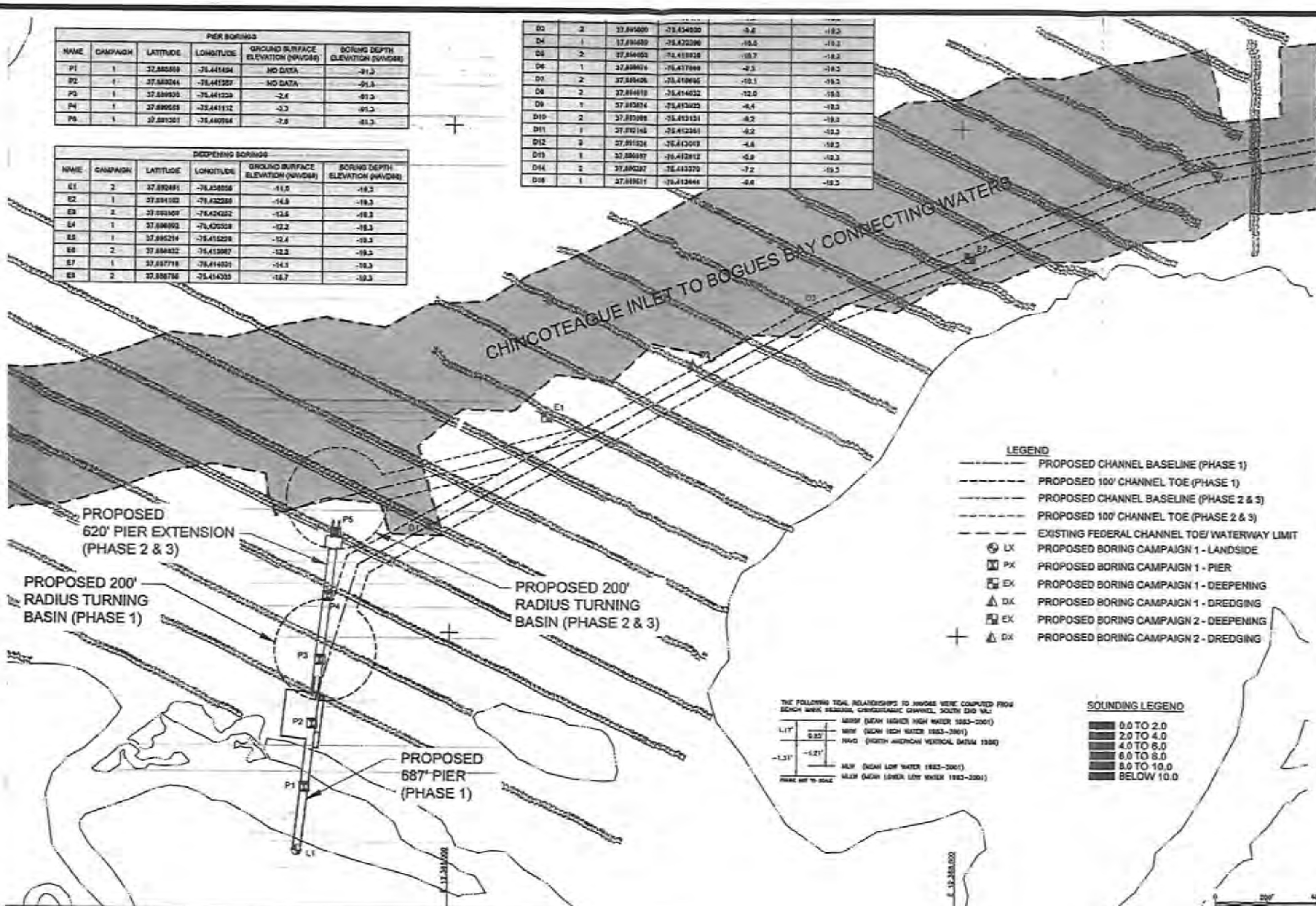
	Date: November 25, 2020
	Scale: 1 in. = 2,000 ft.
	Drawn: ADC Map
Project Location Map Wallops Island M95 Intermodal Barge Wallops Island, Virginia	DWG. No. JDH-10/20/145-A



PIER BORINGS					
NAME	CAMPAIGN	LATITUDE	LONGITUDE	GROUND SURFACE ELEVATION (NAVD88)	BORING DEPTH ELEVATION (NAVD88)
P1	1	37.885589	-75.441494	NO DATA	-91.3
P2	1	37.889244	-75.441387	NO DATA	-91.3
P3	1	37.889835	-75.441239	-2.6	-91.3
P4	1	37.890505	-75.441132	-3.3	-91.3
P5	1	37.891301	-75.440964	-7.8	-91.3

DEEPENING BORINGS					
NAME	CAMPAIGN	LATITUDE	LONGITUDE	GROUND SURFACE ELEVATION (NAVD88)	BORING DEPTH ELEVATION (NAVD88)
E1	2	37.892491	-75.438058	-11.5	-19.3
E2	1	37.894102	-75.432289	-14.9	-19.3
E3	2	37.894509	-75.424252	-13.6	-19.3
E4	1	37.896092	-75.420318	-12.2	-19.3
E5	1	37.895214	-75.415228	-12.4	-19.3
E6	2	37.896432	-75.413087	-12.2	-19.3
E7	1	37.897718	-75.414031	-14.1	-19.3
E8	2	37.898788	-75.414333	-18.7	-19.3

D3	2	37.895600	-75.434030	-9.6	-19.3
D4	1	37.896480	-75.422290	-10.5	-19.3
D5	2	37.896053	-75.419938	-10.7	-19.3
D6	1	37.898974	-75.417998	-8.5	-19.3
D7	2	37.889426	-75.410695	-10.1	-19.3
D8	2	37.894618	-75.414032	-12.0	-19.3
D9	1	37.893874	-75.413925	-6.4	-19.3
D10	2	37.893089	-75.413131	-8.2	-19.3
D11	1	37.892148	-75.412361	-8.2	-19.3
D12	2	37.891526	-75.413013	-4.6	-19.3
D13	1	37.890957	-75.412812	-5.9	-19.3
D14	2	37.890287	-75.413370	-7.2	-19.3
D15	1	37.889611	-75.413444	-8.8	-19.3

THE FOLLOWING TIDAL RELATIONSHIPS TO NAVD88 WERE COMPUTED FROM BENCH MARK, CHINCOTEAGUE CHANNEL, SOUTH END VA.:

FIGURE NOT TO SCALE

HYNES

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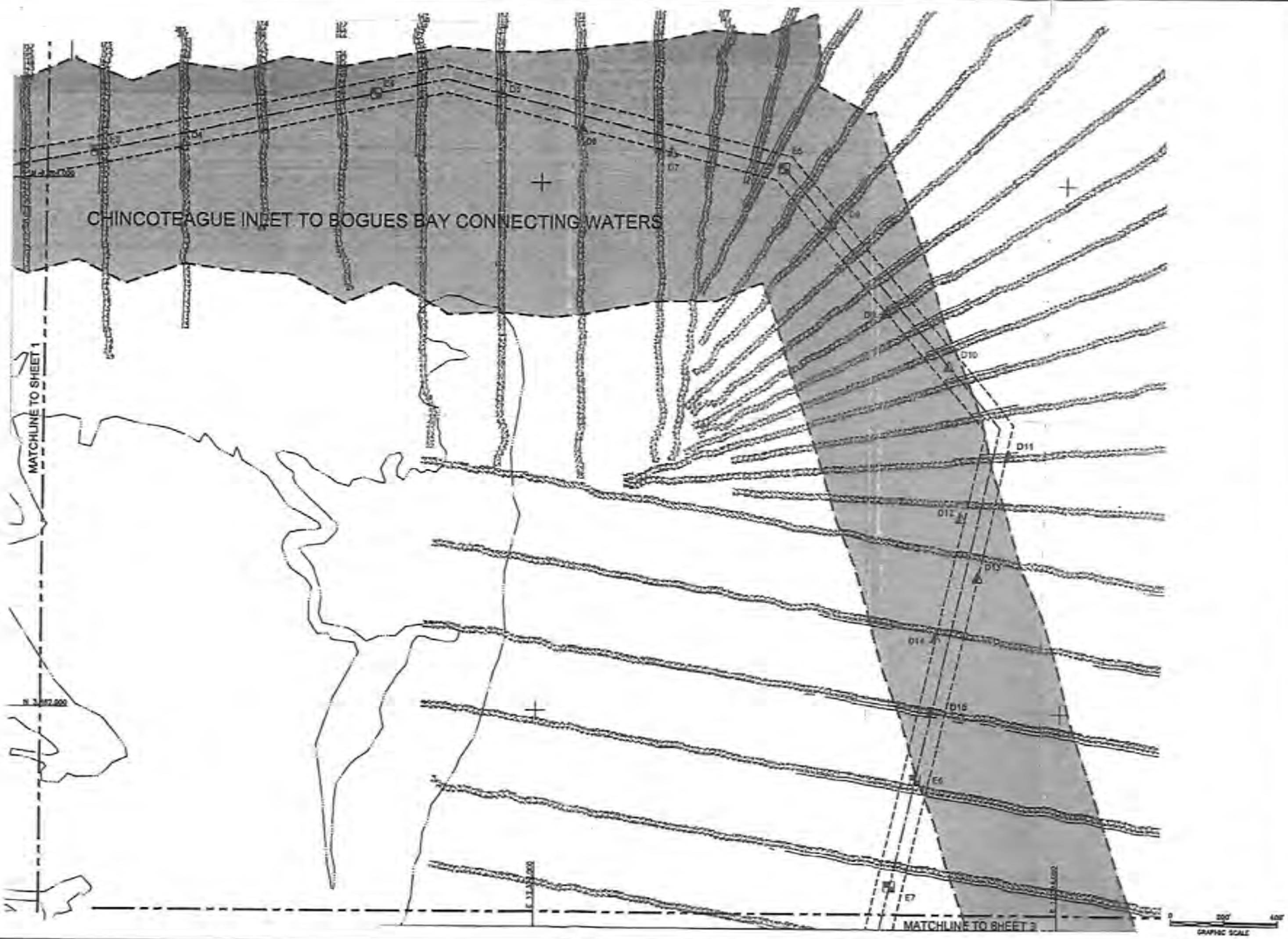
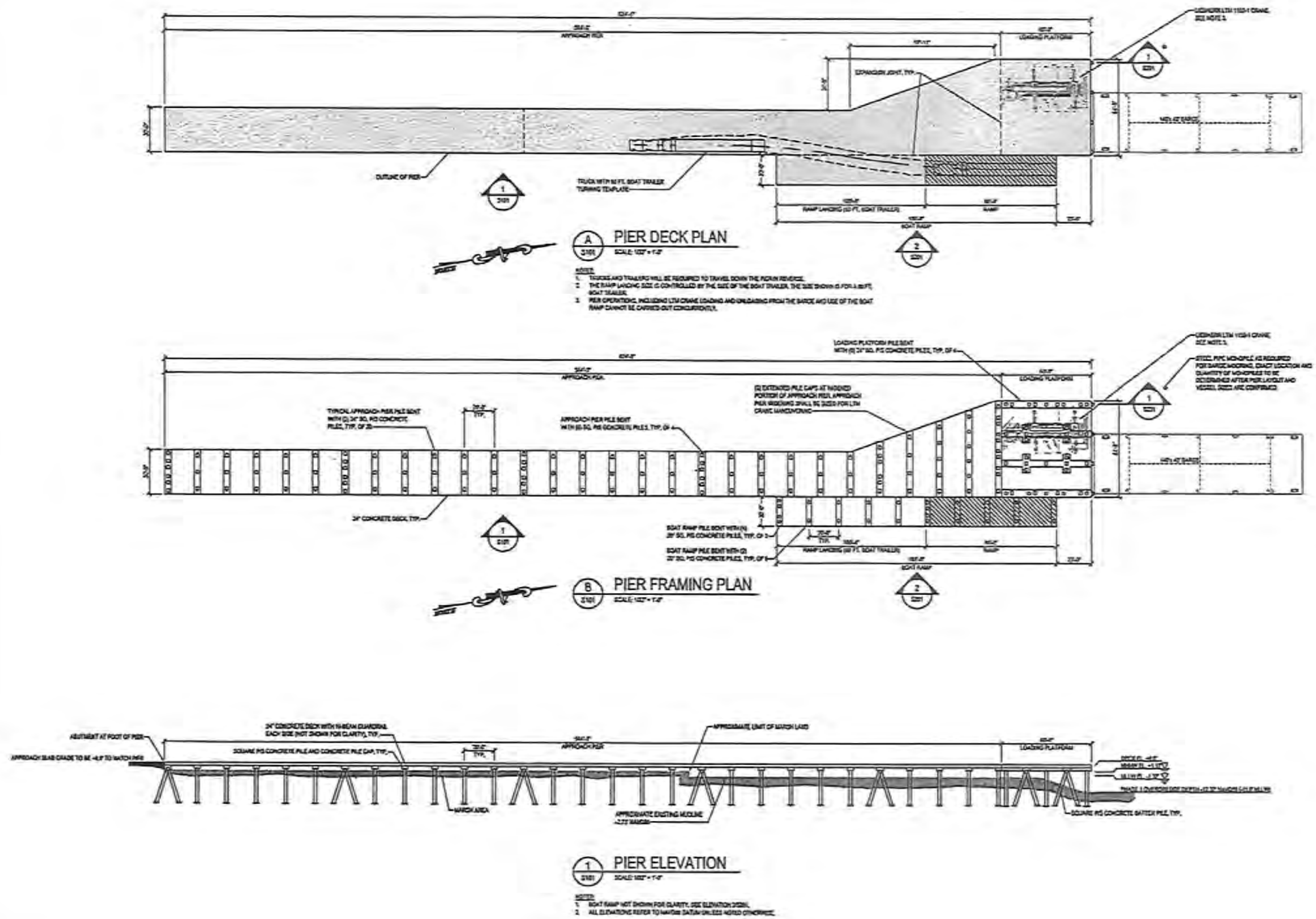
Boring Location Plan
Wallops Island M95 Intermodal Barge
Wallops Island, Virginia

Date: January 18, 2021
Scale: As Shown
Drawn: GBA Engineering
DWG. No. JDH-10/20/145-B-1



HYNES **John D. Hynes & Associates, Inc.** 32185 Beaver Run Drive • Salisbury, Maryland 21804 410-546-6462 / Fax: 410-548-5346	Boring Location Plan Wallops Island M95 Intermodal Barge Wallops Island, Virginia	**Date: January 18, 2021** **Scale: As Shown** **Drawn: GBA Engineering** **DWG. No. JDH-10/20/145-B-2**



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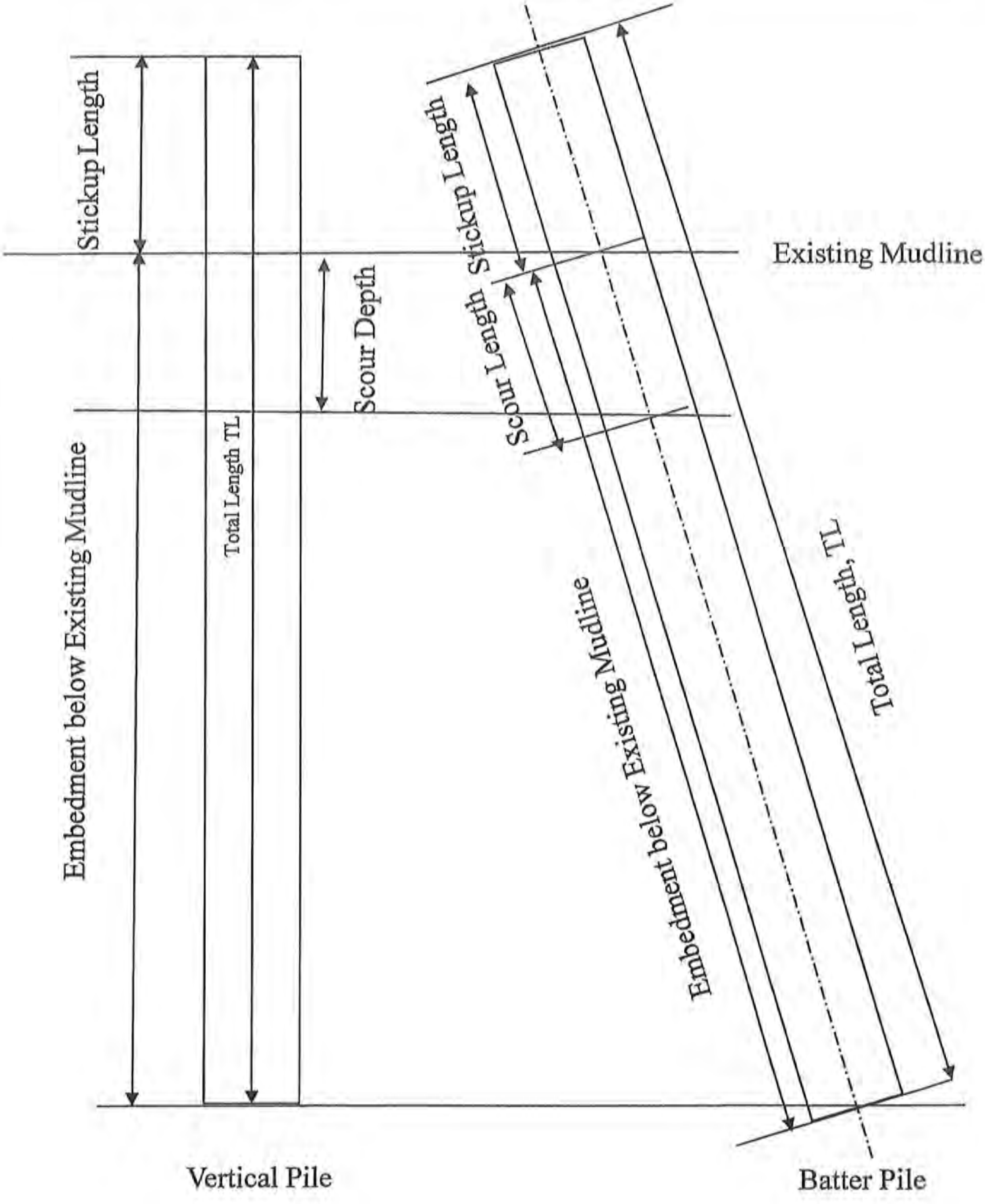
Proposed Pier Plan and Elevation
Wallops Island M95 Intermodal Barge
Wallops Island, Virginia

Date: March 10, 2021
Scale: As Shown
Drawn: GBA Engineering
DWG. No. JDH-10/20/145-C



HYNES **JOHN D. HYNES & ASSOCIATES, INC.**

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410-546-6462 / Fax: 410-548-5346

Date: March 10, 2021

Scale: N/A

Drawn: DD

Pile Properties

Wallops Island M95 Intermodal Barge Service Project

Wallops Island, Virginia

DWG. No.

JDH-10/20/145-D

HYNES & ASSOCIATES	# LOG OF BORING L-1
	(Page 1 of 2)

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed:	: November 13, 2020
Logged By:	: J. Lindsey
Drilled By:	: B. Hynes
Drilling Method:	: HSA (Geoprobe 3230 DT)
Total Depth:	: 90.5 feet

Depth in Feet	Surf. Elev. 4.40	DESCRIPTION	USCS	Sample No.	Blows per 6 inches	Pocket Penetrometer Readings (tons/sq./ft.)
0	4.4	Brown, wet, very loose, fine to medium SAND, with trace silt	SP	1	1-1-2-2	
2	2.4	Dark brown, wet to saturated, very soft, clayey organic SILT, with trace fine sand	MH-OH			
4	.4			2	1-2-1	0.0
6	-1.6			3	1-1-2	
8	-3.6	Gray, saturated, loose to very loose, fine to medium SAND, with trace silt	SP			
10	-5.6			4	2-4-2	
12	-7.6					
14	-9.6			5	1-1-1	
16	-11.6					
18	-13.6	Gray, saturated, very loose, fine to medium SAND, with some silt, trace to little clay	SM			
20	-15.6			6	1-2-1	
22	-17.6					
24	-19.6			7	1-2-2	
26	-21.6					
28	-23.6	Gray, saturated, very soft, clayey SILT, with trace fine sand, trace organic silt	CH			
30	-25.6			8	WOH/18"	
32	-27.6	Gray, saturated, medium stiff to stiff, silty CLAY	CH			
34	-29.6			9	4-5-5	2.0
36	-31.6					
38	-33.6					
40	-35.6			10	3-6-6	2.0
42	-37.6	Brown, saturated, soft, clayey SILT, with trace fine sand	ML			
44	-39.6			11	1-2-2	1.5
46	-41.6					
48	-43.6	Gray, saturated, very loose, fine to medium SAND, with little silt, trace clay, trace shell fragments	SM			
50				12	1-1-2	

REMARKS

Scale 1" ~ 7.4 feet

Approximately 6 inches of organic bearing soil was encountered at the ground surface.

Shelby Tube sample was pushed from 22 to 24 feet.

Groundwater was encountered at 3 feet during drilling operations.

Laboratory Test Results

Sample No. 3
From 6 to 7.5 feet

Natural Moisture = 36.3%

Sample No. 6
From 19 to 20.5 feet

Sieve Analysis

Sieve Size	Passing %
3/8"	100
No. 4	99.1
No. 10	98.5
No. 20	97.9
No. 40	97.4
No. 60	96.1
No. 100	63.8
No. 200	30.1
USCS:	SM

Natural Moisture = 25.1%

Sample No. 8
From 29 to 30.5 feet

Atterberg Limits

Liquid Limit = 57
Plasticity Index = 24
USCS: CH
Natural Moisture = 51.3%

NAD 83 VA State Plane South
Easting: 12365404
Northing: 3861122

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HYNES & ASSOCIATES

LOG OF BORING L-1

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : November 13, 2020
Logged By: : J. Lindsey
Drilled By: : B. Hynes
Drilling Method: : HSA (Geoprobe 3230 DT)
Total Depth: : 90.5 feet

Depth in Feet	Surf. Elev. 4.40	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blows per 6 inches	Pocket Penetrometer Readings (tons/sq./ft.)	REMARKS
50	-45.6	Gray, saturated, very loose, fine to medium SAND, with little silt, trace clay, trace shell fragments		SM	12	1-1-2		The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
52	-47.6							
54	-49.6	Gray, saturated, medium stiff, clayey SILT, with little fine sand, trace shell fragments		ML	13	1-2-4		
56	-51.6							
58	-53.6							
60	-55.6				14	1-2-6		
62	-57.6	Gray, saturated, medium stiff to stiff, clayey SILT, with little fine sand, trace shell fragments		MH				
64	-59.6				15	1-2-4		
66	-61.6							
68	-63.6							
70	-65.6				16	2-4-4		
72	-67.6							
74	-69.6				17	2-4-7		
76	-71.6							
78	-73.6	Gray, saturated, medium dense, fine to medium SAND, with little silt, trace shell fragments		SM				
80	-75.6				18	6-9-12		
82	-77.6	Gray, saturated, dense, fine to medium SAND, with trace to little silt		SP-SM				
84	-79.6				19	8-18-23		
86	-81.6							
88	-83.6							
90	-85.6				20	9-16-24		
92	-87.6	Boring terminated at 90.5 feet.						
94	-89.6							
96	-91.6							
98	-93.6							
100								

03-31-2021 J:\Mtech 2010\Wallops Island M95 Intermodal Barge Service Project-20145\L-1.bor

HYNES & ASSOCIATES

LOG OF BORING P-1

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : November 24, 2020
Logged By: : A. Kus
Drilled By: : M. Hynes
Drilling Method: : HSA (Geoprobe 7822 DT)
Total Depth: : 90.5 feet

Depth in Feet	Surf. Elev. -0.40	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blows per 6 inches
0	-.4	Gray, saturated, organic SILT, with trace fine to medium sand, trace clay		OL	1	HA
2	-2.4					
4	-4.4	Gray, saturated, medium dense, fine to medium SAND, with trace silt		SP	2	4-6-5
6	-6.4	Gray, saturated, medium dense, fine to medium SAND, with trace organic silt		SP	3	3-6-6
8	-8.4					
10	-10.4	Gray, saturated, loose, fine to medium SAND, with trace organic silt		SP	4	2-3-3
12	-12.4					
14	-14.4	Gray, saturated, very loose, fine to medium SAND, with little silt, trace organic silt		SM	5	1-2-1
16	-16.4					
18	-18.4	Gray, saturated, very soft, SILT, with little fine to medium sand, trace clay		ML	6	1-1-2
20	-20.4					
22	-22.4	Gray, saturated, medium dense, fine to medium SAND, with trace silt		SP	7	2-5-6
24	-24.4					
26	-26.4					
28	-28.4					
30	-30.4				8	3-5-8
32	-32.4	Gray, saturated, loose to medium dense, fine to medium SAND, with trace silt		SP	9	3-4-4
34	-34.4					
36	-36.4					
38	-38.4					
40	-40.4				10	3-5-7
42	-42.4					
44	-44.4				11	3-6-10
46	-46.4					
48	-48.4	Gray, saturated, medium dense to dense, fine to medium SAND, with little to trace silt		SM	12	17-19-20
50						

REMARKS

Scale 1" ~ 7.4 feet

No organic bearing soil was encountered at the ground surface.

Groundwater was not encountered during drilling operations.

Laboratory Test Results

Sample No. 2
From 3 to 4.5 feet

Natural Moisture = 25.6%

Sample No. 12
From 49 to 50.5 feet

Sieve Analysis

Sieve Size	Passing %
No. 10	100
No. 20	99.9
No. 40	99.5
No. 60	93.6
No. 100	42.2
No. 200	12.6
USCS:	SM

Natural Moisture = 23.7%

Sample No. 17
From 74 to 75.5 feet

Natural Moisture = 55.7%

NAD 83 VA State Plane South
Easting: 12365439
Northing: 3861379

The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.

HYNES & ASSOCIATES

LOG OF BORING P-1

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : November 24, 2020
Logged By: : A. Kus
Drilled By: : M. Hynes
Drilling Method: : HSA (Geoprobe 7822 DT)
Total Depth: : 90.5 feet

Depth in Feet	Surf. Elev. -0.40	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blows per 6 inches	REMARKS
50	-50.4	Gray, saturated, medium dense to dense, fine to medium SAND, with little to trace silt		SP-SM	12	17-19-20	
52	-52.4						
54	-54.4				13	6-8-11	
56	-56.4						
58	-58.4						
60	-60.4				14	5-6-8	
62	-62.4						
64	-64.4				15	15-17-19	
66	-66.4						
68	-68.4						
70	-70.4				16	12-18-24	
72	-72.4	Gray, saturated, very dense, fine to medium SAND, with little to trace silt		SP-SM			
74	-74.4				17	20-24-27	
76	-76.4						
78	-78.4	Gray, saturated, dense, fine to medium SAND, with little to trace silt		SP-SM			
80	-80.4				18	7-15-19	
82	-82.4						
84	-84.4				19	7-15-18	
86	-86.4						
88	-88.4						
90	-90.4				20	8-16-19	
92	-92.4	Boring terminated at 90.5 feet.					
94	-94.4						
96	-96.4						
98	-98.4						
100							

03-31-2021 J:\Mtech 2010\Wallops Island M95 Intermodal Barge Service Project-20145\P-1.bor

HYNES & ASSOCIATES

LOG OF BORING P-2

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 18, 2020
Logged By: : R. Rhoads
Drilled By: : M. Hynes
Drilling Method: : HSA/Rotary (Mobile B-47 HD)
Total Depth: : 90.5 feet

Depth in Feet	Surf. Elev. -2.80	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count
0	-2.8	Dark gray, saturated, medium dense, fine to medium SAND and SILT, with trace clay, trace organic silt		SM	1	1-6-6
2	-4.8					
4	-6.8	Gray, saturated, medium dense, fine to medium SAND, with little silt		SM	2	6-9-10
6	-8.8					
8	-10.8	Dark gray, saturated, medium dense, fine to medium SAND and SILT, with trace clay, trace organic silt		SM		
10	-12.8				3	3-4-8
12	-14.8					
14	-16.8				4	4-4-7
16	-18.8					
18	-20.8	Dark gray, saturated, medium dense, fine to medium SAND and SILT, with trace clay		SM		
20	-22.8				5	9-7-8
22	-24.8					
24	-26.8				6	8-10-13
26	-28.8					
28	-30.8					
30	-32.8				7	5-8-11
32	-34.8					
34	-36.8	Gray, saturated, medium dense, fine to medium SAND, with little silt, trace shell fragments		SM	8	12-13-15
36	-38.8					
38	-40.8					
40	-42.8				9	12-12-10
42	-44.8					
44	-46.8	Dark gray, saturated, medium dense, fine to medium SAND and SILT, with trace clay		SM	10	2-5-7
46	-48.8					
48	-50.8	Gray, saturated, stiff, silty CLAY, with trace fine sand, trace shell fragments		CL-ML		
50					11	4-5-7

REMARKS

Scale 1" ~ 7.4 feet

No organic bearing soil was encountered at the ground surface.

Water Depth: 3.7 ft.

Laboratory Test Results

Sample No. 11
From 49 to 50.5 feet

Atterberg Limits

Liquid Limit = 28
Plasticity Index = 7
USCS: CL-ML
Natural Moisture = 31.4%

NAD 83 VA State Plane South
Easting: 12365462
Northing: 3861627

The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.

03-30-2021 J:\Mtech 2010\Wallops Island M95 Intermodal Barge Service Project-20145\P-2.bor

HYNES & ASSOCIATES	LOG OF BORING P-2
	(Page 2 of 2)

Gahagan & Bryant Associates, Inc. 9008 Yellow Brick Road, Unit O Baltimore, Maryland	Date Completed:	: December 18, 2020	
	Logged By:	: R. Rhoads	
	Drilled By:	: M. Hynes	
Wallops Island M95 Intermodal Barge Service	Drilling Method:	: HSA/Rotary (Mobile B-47 HD)	
Project No.: JDH-10/20/145	Total Depth:	: 90.5 feet	

Depth in Feet	Surf. Elev. -2.80
50	-52.8
52	-54.8
54	-56.8
56	-58.8
58	-60.8
60	-62.8
62	-64.8
64	-66.8
66	-68.8
68	-70.8
70	-72.8
72	-74.8
74	-76.8
76	-78.8
78	-80.8
80	-82.8
82	-84.8
84	-86.8
86	-88.8
88	-90.8
90	-92.8
92	-94.8
94	-96.8
96	-98.8
98	-100.8
100	

DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
Gray, saturated, stiff, CLAY and SILT, with trace fine sand, trace shell fragments		CL-ML	11	4-5-7	
Gray, saturated, very stiff, silty CLAY, with some to little fine sand, trace shell fragments		CL	12	4-8-9	
Gray, saturated, stiff, silty CLAY, with little to trace fine sand		CL	13	4-6-8	
			14	6-7-8	
Gray, saturated, very stiff, silty CLAY, with some fine to coarse sand, little shell fragments		CL	15	9-10-13	
Gray, saturated, dense, fine to coarse SAND, with some silt, little shell fragments		SM	16	12-17-28	
Gray, saturated, dense, fine to medium SAND, with some clay, some silt		SC	17	9-12-19	
Gray, saturated, very dense, fine to coarse SAND, with some to little silt, trace clay, trace shell fragments		SM	18	20-50/5"	
Gray, saturated, very dense, fine to coarse SAND, with some gravel, trace silt		SP	19	30-37-43	

Boring terminated at 90.5 feet.

HYNES & ASSOCIATES

LOG OF BORING P-3

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 17, 2020
Logged By: : A. Kus
Drilled By: : M. Hynes
Drilling Method: : HSA/Rotary (Mobile B-47 HD)
Total Depth: : 90.5 feet

Depth in Feet	Surf. Elev. -2.70	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count
0–3	-2.7 to -5.7	Gray, saturated, loose, SILT, with little fine to medium sand, trace clay		ML	1	1-4-6
3–8.5	-5.7 to -11.2	Gray, saturated, medium dense, fine to medium SAND, with trace silt		SP	2	8-11-11
8.5–12	-11.2 to -14.7	Gray, saturated, loose, fine to medium SAND, with some to little silt, trace clay		SM	3	6-3-6
12–27	-14.7 to -29.7	Gray, saturated, medium dense, fine to medium SAND, with little to trace silt		SP-SM	4	3-7-7
					5	8-8-12
					6	9-13-18
27–32	-29.7 to -34.7	Gray, saturated, medium dense, fine to medium SAND, with little silt, trace clay		SM	7	10-10-11
32–42	-34.7 to -44.7	Gray, saturated, medium dense, fine to medium SAND, with little to trace silt		SP-SM	8	10-8-11
					9	9-14-11
42–47	-44.7 to -49.7	Gray, saturated, medium dense, fine to medium SAND, with some to little silt, trace clay		SM	10	7-12-15
47–50	-49.7 to -52.7	Gray, saturated, stiff, clayey SILT, with little fine to medium sand, trace shell fragments		ML	11	4-6-6

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50
Elevation scale: -2.7, -4.7, -6.7, -8.7, -10.7, -12.7, -14.7, -16.7, -18.7, -20.7, -22.7, -24.7, -26.7, -28.7, -30.7, -32.7, -34.7, -36.7, -38.7, -40.7, -42.7, -44.7, -46.7, -48.7, -50.7

REMARKS

Scale 1" ~ 7.4 feet

No organic bearing soil was encountered at the ground surface.

Water Depth: 4.5 ft. at 12:00 pm

Laboratory Test Results

Sample No. 2
From 4 to 5.5 feet

Sieve Analysis

Sieve Size	Passing %
No. 20	100
No. 40	99.5
No. 60	85.6
No. 100	86.1
No. 200	5.5
USCS:	SP

Natural Moisture = 23.1%

Sample No. 8
From 34 to 35.5 feet

Natural Moisture = 23.5%

Sample No. 12
From 54 to 55.5 feet

Atterberg Limits

Liquid Limit = 33
Plasticity Index = 20
USCS: CL
Natural Moisture = 25.5%

Sample No. 16
From 74 to 75.5 feet

Atterberg Limits

Liquid Limit = 60
Plasticity Index = 28
USCS: CH
Natural Moisture = 39.1%

NAD 83 VA State Plane South
Easting: 12365490
Northing: 3861891

LOG OF BORING P-3

HYNES & ASSOCIATES

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed:	: December 17, 2020
Logged By:	: A. Kus
Drilled By:	: M. Hynes
Drilling Method:	: HSA/Rotary (Mobile B-47 HD)
Total Depth:	: 90.5 feet

Depth in Feet	Surf. Elev. -2.70	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
50	-52.7	Gray, saturated, stiff, clayey SILT, with little fine to medium sand, trace shell fragments		ML	11	4-6-6	The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
52	-54.7	Gray, saturated, very stiff, silty CLAY, with little fine to medium sand, little shell fragments		CL	12	6-8-10	
54	-56.7						
56	-58.7						
58	-60.7						
60	-62.7				13	8-8-10	
62	-64.7	Gray, saturated, very stiff, clayey SILT, with little fine to medium sand, trace shell fragments		ML	14	7-8-11	
64	-66.7						
66	-68.7						
68	-70.7	Gray, saturated, very stiff, silty CLAY, with little fine to medium sand, trace shell fragments		CL	15	10-11-10	
70	-72.7						
72	-74.7	Gray, saturated, very stiff, clayey SILT, with trace fine to medium sand		CH	16	8-12-14	
74	-76.7						
76	-78.7						
78	-80.7	Gray, saturated, very stiff, clayey SILT, with little fine to coarse sand, trace shell fragments		ML/MH	17	9-13-14	
80	-82.7						
82	-84.7	Gray, saturated, dense, fine to medium SAND, with little silt, trace clay		SM	18	14-24-30	
84	-86.7						
86	-88.7						
88	-90.7	Gray, saturated, very dense, fine to coarse SAND, with trace silt		SP	19	20-29-39	
90	-92.7	Boring terminated at 90.5 feet.					
92	-94.7						
94	-96.7						
96	-98.7						
98	-100.7						
100							

HYNES & ASSOCIATES

LOG OF BORING P-4

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed:	: December 23, 2020
Logged By:	: D. Csanda
Drilled By:	: B. Hynes
Drilling Method:	: HSA/Rotary (Mobile B-47 HD)
Total Depth:	: 120.5 feet

Depth in Feet	Surf. Elev. -2.70	DESCRIPTION	USCS	Sample	Blow Count
0	-2.7	Gray, saturated, loose, fine to medium SAND, with trace silt	SP	1	1-4-6
2	-4.7	Gray, saturated, medium dense, fine to medium SAND, with trace silt	SP	2	8-8-10
4	-6.7				
6	-8.7				
8	-10.7	Gray, saturated, very loose, fine to medium SAND, with little silt	SM	3	1-1-2
10	-12.7				
12	-14.7	Gray, saturated, medium dense, fine to medium SAND, with little silt	SM	4	3-8-8
14	-16.7				
16	-18.7				
18	-20.7				
20	-22.7			5	12-12-17
22	-24.7	Gray, saturated, medium dense, fine to medium SAND, with little silt, trace shell fragments	SM	6	17-17-10
24	-26.7				
26	-28.7				
28	-30.7	Gray to brown, saturated, very stiff, silty CLAY	CL	7	5-8-11
30	-32.7				
32	-34.7	Gray, saturated, very stiff, silty CLAY, with trace fine to medium sand	CL	8	7-10-13
34	-36.7				
36	-38.7				
38	-40.7	Gray, saturated, soft, silty CLAY, with trace fine to medium sand, trace shell fragments	CL	9	3-2-2
40	-42.7				
42	-44.7	Gray, saturated, very stiff, silty CLAY, with trace fine to meidum sand, trace shell fragments	CL	10	3-7-10
44	-46.7				
46	-48.7				
48	-50.7	Gray, saturated, hard to stiff, silty CLAY, with some fine to medium sand, trace shell fragments	CL	11	7-14-18
50					

REMARKS

Scale 1" ~ 7.4 feet

No organic bearing soil was encountered at the ground surface.

Water Depth: 2 ft. 3 in. at 8:30 am

Shelby Tube sample was pushed from 32 to 34 feet with no recovery.

Laboratory Test Results

Sample No. 11
From 49 to 50.5 feet

Atterberg Limits

Liquid Limit =	33
Plasticity Index =	14
USCS:	CL
Natural Moisture =	25.7%

Sample No. 23
From 109 to 110.5 feet

Atterberg Limits

Liquid Limit =	49
Plasticity Index =	17
USCS:	ML
Natural Moisture =	34.9%

NAD 83 VA State Plane South
Easting: 12365519
Northing: 3862142

The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.

HYNES & ASSOCIATES	LOG OF BORING P-4 (Page 2 of 3)

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service
Project No.: JDH-10/20/145

Date Completed: : December 23, 2020
Logged By: : D. Csanda
Drilled By: : B. Hynes
Drilling Method: : HSA/Rotary (Mobile B-47 HD)
Total Depth: : 120.5 feet

Depth in Feet	Surf. Elev. -2.70	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
50	-52.7	Gray, saturated, hard to stiff, silty CLAY, with some fine to medium sand, trace shell fragments			11	7-14-18	
52	-54.7						
54	-56.7				12	14-18-20	
56	-58.7			CL			
58	-60.7						
60	-62.7				13	12-6-6	
62	-64.7	Gray, saturated, stiff, silty CLAY, with trace shell fragments					
64	-66.7				14	4-6-8	
66	-68.7						
68	-70.7			CL			
70	-72.7				15	5-6-7	
72	-74.7	Gray, saturated, hard, silty CLAY, with trace fine to medium sand					
74	-76.7			CL	16	17-21-33	
76	-78.7						
78	-80.7	Gray, saturated, very stiff to hard, silty CLAY, with some fine to medium sand, little shell fragments					
80	-82.7				17	10-17-25	
82	-84.7						
84	-86.7				18	10-13-18	
86	-88.7						
88	-90.7			CL			
90	-92.7				19	10-14-15	
92	-94.7						
94	-96.7				20	17-24-34	
96	-98.7						
98	-100.7	Gray, saturated, hard, silty CLAY, with trace fine to medium sand		CL			
100					21	14-16-21	

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HYNES & ASSOCIATES	# LOG OF BORING P-4 (Page 3 of 3)

Gahagan & Bryant Associates, Inc. 9008 Yellow Brick Road, Unit O Baltimore, Maryland	Date Completed:	: December 23, 2020
	Logged By:	: D. Csanda
	Drilled By:	: B. Hynes
Wallops Island M95 Intermodal Barge Service	Drilling Method:	: HSA/Rotary (Mobile B-47 HD)
Project No.: JDH-10/20/145	Total Depth:	: 120.5 feet

Depth in Feet	Surf. Elev. -2.70	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
100	-102.7	Gray, saturated, hard, silty CLAY, with trace fine to medium sand		CL	21	14-16-21	
102	-104.7						
104	-106.7				22	10-21-30	
106	-108.7						
108	-110.7	Gray, saturated, hard, clayey SILT, with trace fine to medium sand		ML			
110	-112.7				23	22-40-50/4"	
112	-114.7	Gray, saturated, hard, silty CLAY, with trace fine to medium sand		CL			
114	-116.7				24	18-32-48	
116	-118.7						
118	-120.7						
120	-122.7				25	20-41-50/5"	
122	-124.7	Boring terminated at 120.5 feet.					
124	-126.7						
126	-128.7						
128	-130.7						
130	-132.7						
132	-134.7						
134	-136.7						
136	-138.7						
138	-140.7						
140	-142.7						
142	-144.7						
144	-146.7						
146	-148.7						
148	-150.7						
150							

HYNES & ASSOCIATES

LOG OF BORING P-5

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed:	: December 21, 2020
Logged By:	: D. Csanda
Drilled By:	: B. Hynes
Drilling Method:	: HSA/Rotary (Mobile B-47 HD)
Total Depth:	: 110.5 feet

Depth in Feet	Surf. Elev. -10.50
0	-10.5
2	-12.5
4	-14.5
6	-16.5
8	-18.5
10	-20.5
12	-22.5
14	-24.5
16	-26.5
18	-28.5
20	-30.5
22	-32.5
24	-34.5
26	-36.5
28	-38.5
30	-40.5
32	-42.5
34	-44.5
36	-46.5
38	-48.5
40	-50.5
42	-52.5
44	-54.5
46	-56.5
48	-58.5
50	

DESCRIPTION	USCS	Sample	Blow Count
Gray, saturated, very loose, fine to medium SAND and SILT, with trace organic silt	SM	1	1-2-2
Gray, saturated, medium dense, fine to medium SAND, with trace silt, trace organic silt	SP	2	7-7-10
		3	8-9-9
		4	7-8-8
Gray, saturated, medium dense, fine to medium SAND, with trace shell fragments	SP	5	10-8-10
Gray, saturated, very soft, clayey SILT, with trace fine to medium sand	ML	6	1-2-2
Gray to brown, saturated, stiff, silty CLAY, with trace fine to medium sand	CL-CH	7	1-4-8
		8	3-6-8
Brown, saturated, stiff, silty CLAY, with trace fine to medium sand	CL	9	5-6-9
Gray, saturated, very stiff, silty CLAY, with trace fine to medium sand, trace shell fragments	CL	10	2-3-4
Gray, saturated, stiff to very stiff, silty CLAY, with some fine to medium sand, trace shell fragments	CL	11	4-4-10
		12	4-10-11

REMARKS

Scale 1" ~ 7.4 feet

No organic bearing soil was encountered at the ground surface.

Water Depth: 12 ft. at 10:30 am

Shelby Tube sample was pushed from 42 to 44 feet.

Laboratory Test Results

Sample No. 3
From 6 to 7.5 feet

Natural Moisture = 27.6%

Sample No. 2
From 4 to 5.5 feet

Sieve Analysis

Sieve Size	Passing %
No. 20	100
No. 40	99.7
No. 60	83.3
No. 100	32.9
No. 200	4.8
USCS:	SP

Natural Moisture = 25.3%

Sample No. 8
From 29 to 30.5 feet

Atterberg Limits

Liquid Limit =	50
Plasticity Index =	27
USCS:	CL-CH
Natural Moisture =	32.1%

Sample No. 14
From 59 to 60.5 feet

Atterberg Limits

Liquid Limit =	67
Plasticity Index =	40
USCS:	CH
Natural Moisture =	43.2%

HYNES & ASSOCIATES

LOG OF BORING P-5

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 21, 2020
Logged By: : D. Csanda
Drilled By: : B. Hynes
Drilling Method: : HSA/Rotary (Mobile B-47 HD)
Total Depth: : 110.5 feet

Depth in Feet	Surf. Elev. -10.50	DESCRIPTION	USCS	Sample	Blow Count
50	-60.5	Gray, saturated, stiff to very stiff, silty CLAY, with some fine to medium sand, trace shell fragments	CL	12	4-10-11
52	-62.5				
54	-64.5	Gray, saturated, very stiff, silty CLAY, with trace shell fragments	CL	13	5-10-12
56	-66.5				
58	-68.5	Gray, saturated, very stiff, silty CLAY	CH	14	6-8-11
60	-70.5				
62	-72.5	Gray, saturated, very stiff, silty CLAY, with some fine to medium sand, trace shell fragments	CL	15	8-8-10
64	-74.5				
66	-76.5				
68	-78.5	Gray, saturated, dense, fine to medium SAND and SILT, with trace clay, trace shell fragments	SM	16	11-13-20
70	-80.5				
72	-82.5				
74	-84.5			17	13-14-19
76	-86.5				
78	-88.5	Gray, saturated, medium dense, fine to medium SAND, with some silt, trace shell fragments	SM	18	6-11-18
80	-90.5				
82	-92.5	Gray, saturated, hard, silty CLAY	CL	19	9-13-21
84	-94.5				
86	-96.5				
88	-98.5				
90	-100.5			20	16-21-30
92	-102.5	Gray, saturated, hard, silty CLAY, with trace fine to medium sand	CL	21	17-24-38
94	-104.5				
96	-106.5				
98	-108.5	Gray, saturated, hard, silty CLAY	CL	22	18-31-43
100					

REMARKS

Sample No. 23
From 104 to 105.5 feet

Natural Moisture = 39.2%

NAD 83 VA State Plane South
Easting: 12365548
Northing: 3862392

The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.

HYNES & ASSOCIATES	LOG OF BORING P-5
	(Page 3 of 3)

Gahagan & Bryant Associates, Inc. 9008 Yellow Brick Road, Unit O Baltimore, Maryland	Date Completed:	: December 21, 2020
	Logged By:	: D. Csanda
	Drilled By:	: B. Hynes
Wallops Island M95 Intermodal Barge Service	Drilling Method:	: HSA/Rotary (Mobile B-47 HD)
Project No.: JDH-10/20/145	Total Depth:	: 110.5 feet

Depth in Feet	Surf. Elev. -10.50	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
100	-110.5	Gray, saturated, hard, silty CLAY		CL	22	18-31-43	
102	-112.5						
104	-114.5				23	19-36-47	
106	-116.5						
108	-118.5						
110	-120.5				24	20-34-47	
		Boring terminated at 110.5 feet.					
112	-122.5						
114	-124.5						
116	-126.5						
118	-128.5						
120	-130.5						
122	-132.5						
124	-134.5						
126	-136.5						
128	-138.5						
130	-140.5						
132	-142.5						
134	-144.5						
136	-146.5						
138	-148.5						
140	-150.5						
142	-152.5						
144	-154.5						
146	-156.5						
148	-158.5						
150							

HYNES & ASSOCIATES

LOG OF BORING D-2

(Page 1 of 1)

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed:	: December 28, 2020
Logged By:	: D. Csanda
Drilled By:	: M. Hynes
Drilling Method:	: HSA (Mobile B-47 HD)
Total Depth:	: 14 feet

Depth in Feet	Surf. Elev. -10.30	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count
0	-10.3	Gray, saturated, medium dense, fine to medium SAND, with trace silt, trace clay		SP	1	7-6-6-7
2	-12.3				2	7-7-7-8
4	-14.3	Gray, saturated, loose, fine to medium SAND, with little to trace silt		SP-SM	3	11-4-4-5
6	-16.3				4	6-4-4-3
8	-18.3	Gray, saturated, loose, fine to medium SAND, with trace silt, trace clay		SP	5	8-2-4-5
10	-20.3	Gray, saturated, medium dense, fine to medium SAND, with little to trace silt		SP-SM	6	5-6-6-8
12	-22.3	Gray, saturated, medium dense, fine to medium SAND, with trace silt, trace shells		SP	7	12-6-5-8
14	-24.3	Boring terminated at 14 feet.				
16	-26.3					
18	-28.3					
20						

REMARKS

Scale 1" ~ 3 feet

No organic bearing soil was encountered at the ground surface.

Water Depth: 13.0 ft.

Laboratory Test Results

Sample No. 5
From 8 to 10 feet

Hydrometer Analysis (See Graph)
USCS: SP
Natural Moisture = 20.0%

NAD 83 VA State Plane South
Easting: 12366943
Northing: 3863058

The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.

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HYNES & ASSOCIATES

LOG OF BORING D-4

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed:	: December 28, 2020
Logged By:	: D. Csanda
Drilled By:	: M. Hynes
Drilling Method:	: HSA (Mobile B-47 HD)
Total Depth:	: 10 feet

Depth in Feet	Surf. Elev. -11.40	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count
0	-11.4	Gray, saturated, very loose, fine to medium SAND, with trace shells		SP	1	4-2-2-3
2	-13.4	Gray, saturated, medium dense, fine to medium SAND, with trace shells		SP	2	7-3-7-5
4	-15.4				3	6-6-7-7
6	-17.4	Gray, saturated, very loose, fine to medium SAND, with little to trace silt, trace clay		SP-SM	4	1-1-2-3
8	-19.4	Gray, saturated, soft, SILT, with some fine to medium sand, little clay		ML	5	1-1-2-3
10	-21.4	Boring terminated at 10 feet.				
12	-23.4					
14	-25.4					
16	-27.4					
18	-29.4					
20						

REMARKS

Scale 1" ~ 3 feet

No organic bearing soil was encountered at the ground surface.

Water Depth: 11.5 ft.

Laboratory Test Results

Sample No. 5
From 8 to 10 feet

Hydrometer Analysis (See Graph)
USCS: ML
Natural Moisture = 31.0%

NAD 83 VA State Plane South
Easting: 12370656
Northing: 3864121

The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.

HYNES & ASSOCIATES

LOG OF BORING D-6

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 31, 2020
Logged By: : D. Csanda
Drilled By: : M. Hynes
Drilling Method: : HSA (Mobile B-47 HD)
Total Depth: : 10 feet

Depth in Feet	Surf. Elev. -10.10	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-10.1	Gray, saturated, medium dense, fine to medium SAND, with trace silt		SP	1	24-9-8-8	Scale 1" ~ 3 feet No organic bearing soil was encountered at the ground surface. Water Depth: 16.0 ft.
2	-12.1				2	18-20-27-15	Laboratory Test Results Sample No. 1 From 0 to 2 feet
4	-14.1	Gray, satuarated, dense, fine to medium SAND, with trace silt, trace shells		SP	3	16-15-18-18	Hydrometer Analysis (See Graph) USCS: SP Natural Moisture = 24.9%
6	-16.1				4	12-14-19-20	Sample No. 3 From 4 to 6 feet Hydrometer Analysis (See Graph) USCS: SP Natural Moisture = 17.0%
8	-18.1				5	17-15-22-24	NAD 83 VA State Plane South Easting: 12372163 Northing: 3864201
10	-20.1	Boring terminated at 10 feet.					The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
12	-22.1						
14	-24.1						
16	-26.1						
18	-28.1						
20							

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HYNES & ASSOCIATES

LOG OF BORING D-9

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : January 5, 2021
Logged By: : D. Csanda
Drilled By: : M. Hynes
Drilling Method: : HSA (Mobile B-47 HD)
Total Depth: : 18 feet

Depth in Feet	Surf. Elev. -3.10	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-3.1	Brown, saturated, loose, fine to medium SAND, with trace shells, trace silt		SP	1	13-5-5-4	Scale 1" ~ 3 feet
2	-5.1				2	15-6-5-5	No organic bearing soil was encountered at the ground surface. Water Depth: 4.3 ft. Laboratory Test Results
4	-7.1	Brown to gray, saturated, loose to medium dense, fine to medium SAND, with trace silt, trace shells		SP	3	8-2-5-4	Sample No. 7 From 12 to 14 feet. Hydrometer Analysis (See Graph) USCS: SP Natural Moisture = 17.9%
6	-9.1				4	6-7-5-5	NAD 83 VA State Plane South Easting: 12373304 Northing: 3863541
8	-11.1				5	7-4-5-7	The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
10	-13.1				6	15-5-6-7	
12	-15.1	Gray, saturated, dense, fine to medium SAND, with trace silt		SP	7	17-17-19-20	
14	-17.1	Gray, saturated, dense, fine to medium SAND, with trace silt, trace shells		SP	8	20-16-19-21	
16	-19.1				9	15-17-20-22	
18	-21.1	Boring terminated at 18 feet.					
20							

HYNES & ASSOCIATES	LOG OF BORING D-11 (Page 1 of 1)

Gahagan & Bryant Associates, Inc. 9008 Yellow Brick Road, Unit O Baltimore, Maryland	Date Completed:	: January 5, 2021
Wallops Island M95 Intermodal Barge Service	Logged By:	: D. Csanda
Project No.: JDH-10/20/145	Drilled By:	: M. Hynes
	Drilling Method:	: HSA (Mobile B-47 HD)
	Total Depth:	: 10 feet

Depth in Feet	Surf. Elev. -10.90	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-10.9	Brown, saturated, medium dense, fine to medium SAND, with trace silt		SP	1	12-11-6-7	Scale 1" ~ 3 feet No organic bearing soil was encountered at the ground surface. Water Depth: 15.7 ft. Laboratory Test Results Sample No. 5 From 8 to 10 feet Hydrometer Analysis (See Graph) USCS: SP Natural Moisture = 23.1% NAD 83 VA State Plane South Easting: 12373834 Northing: 3863013 The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
2	-12.9	Brown, saturated, medium dense, fine to medium SAND, with trace silt, trace shells		SP	2	8-11-12-11	
4	-14.9	Brown, satuarated, medium dense, fine to medium SAND, with trace silt		SP	3	6-7-7-4	
6	-16.9				4	8-9-11-13	
8	-18.9	Gray, saturated, loose, fine to medium SAND, with trace silt		SP	5	4-3-4-6	
10	-20.9	Boring terminated at 10 feet.					
12	-22.9						
14	-24.9						
16	-26.9						
18	-28.9						
20							

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HYNES & ASSOCIATES

LOG OF BORING D-13

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed:	: January 4, 2021
Logged By:	: D. Csanda
Drilled By:	: M. Hynes
Drilling Method:	: HSA (Mobile B-47 HD)
Total Depth:	: 4 feet

Depth in Feet	Surf. Elev. -7.70	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-7.7	Brown, saturated, loose, fine to medium SAND, with trace silt		SP	1	5-4-4-4	Scale 1" ~ 3 feet No organic bearing soil was encountered at the ground surface. Water Depth: 10.0 ft. NAD 83 VA State Plane South Easting: 12373678 Northing: 3862510 The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
2	-9.7	Brown, saturated, medium dense, fine to medium SAND, with trace silt, trace shells		SP	2	15-9-9-10	
4	-11.7	Boring terminated at 4 feet.					
6	-13.7						
8	-15.7						
10	-17.7						
12	-19.7						
14	-21.7						
16	-23.7						
18	-25.7						
20							

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HYNES & ASSOCIATES

LOG OF BORING D-15

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed:	: January 4, 2021
Logged By:	: D. Csanda
Drilled By:	: M. Hynes
Drilling Method:	: HSA (Mobile B-47 HD)
Total Depth:	: 10 feet

Depth in Feet	Surf. Elev. -10.40	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-10.4	Brown, saturated, medium dense, fine to medium SAND, with trace silt		SP	1	2-5-5-6	Scale 1" ~ 3 feet No organic bearing soil was encountered at the ground surface. Water Depth: 10.0 ft. Laboratory Test Results Sample No. 5 From 8 to 10 feet Hydrometer Analysis (See Graph) USCS: SP Natural Moisture = 17.0% NAD 83 VA State Plane South Easting: 12373512 Northing: 3862000 The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
2	-12.4	Gray, saturated, medium dense, fine to medium SAND, with trace silt		SP	2	6-4-4-7	
4	-14.4	Brown to gray, satuarated, dense, fine to medium SAND, with trace silt, trace shells		SP	3	9-11-17-20	
6	-16.4	Brown to gray, saturated, medium dense, fine to medium SAND, with trace silt, trace shells		SP	4	7-8-13-14	
8	-18.4				5	9-10-14-15	
10	-20.4	Boring terminated at 10 feet.					
12	-22.4						
14	-24.4						
16	-26.4						
18	-28.4						
20							

HYNES & ASSOCIATES

LOG OF BORING E-2

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed:	: December 28, 2020
Logged By:	: D. Csanda
Drilled By:	: M. Hynes
Drilling Method:	: HSA (Mobile B-47 HD)
Total Depth:	: 8 feet

Depth in Feet	Surf. Elev. -17.50	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-17.5	Gray, saturated, medium dense, fine to medium SAND, with trace shells		SP	1	8-7-6-5	Scale 1" ~ 3 feet No organic bearing soil was encountered at the ground surface.
2	-19.5	Gray, saturated, medium dense, fine to medium SAND, with trace shells		SP	2	10-5-5-8	Water Depth: 16.0 ft. Laboratory Test Results Sample No. 2 From 2 to 4 feet
4	-21.5				3	19-5-7-7	Hydrometer Analysis (See Graph) USCS: SP Natural Moisture = 22.4%
6	-23.5				4	11-6-6-8	NAD 83 VA State Plane South Easting: 12368034 Northing: 3863493
8	-25.5	Boring terminated at 8 feet.					The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
10	-27.5						
12	-29.5						
14	-31.5						
16	-33.5						
18	-35.5						
20							

HYNES & ASSOCIATES

LOG OF BORING E-4

(Page 1 of 1)

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed:	: December 28, 2020
Logged By:	: D. Csanda
Drilled By:	: M. Hynes
Drilling Method:	: HSA (Mobile B-47 HD)
Total Depth:	: 8 feet

Depth in Feet	Surf. Elev. -12.00	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-12	Brown, saturated, loose, fine to medium SAND, with little to trace silt, trace clay		SP	1	4-3-3-3	Scale 1" ~ 3 feet No organic bearing soil was encountered at the ground surface.
2	-14	Gray, saturated, loose to medium dense, fine to medium SAND, with trace shells			2	5-5-4-5	Water Depth: 11.0 ft. Laboratory Test Results
4	-16			SP	3	6-8-3-5	Sample No. 4 From 6 to 8 feet Hydrometer Analysis (See Graph) USCS: SP Natural Moisture = 18.4%
6	-18				4	6-6-10-11	NAD 83 VA State Plane South Easting: 12371382 Northing: 3864328
8	-20	Boring terminated at 8 feet.					The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
10	-22						
12	-24						
14	-26						
16	-28						
18	-30						
20							

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HYNES & ASSOCIATES

LOG OF BORING E-7

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

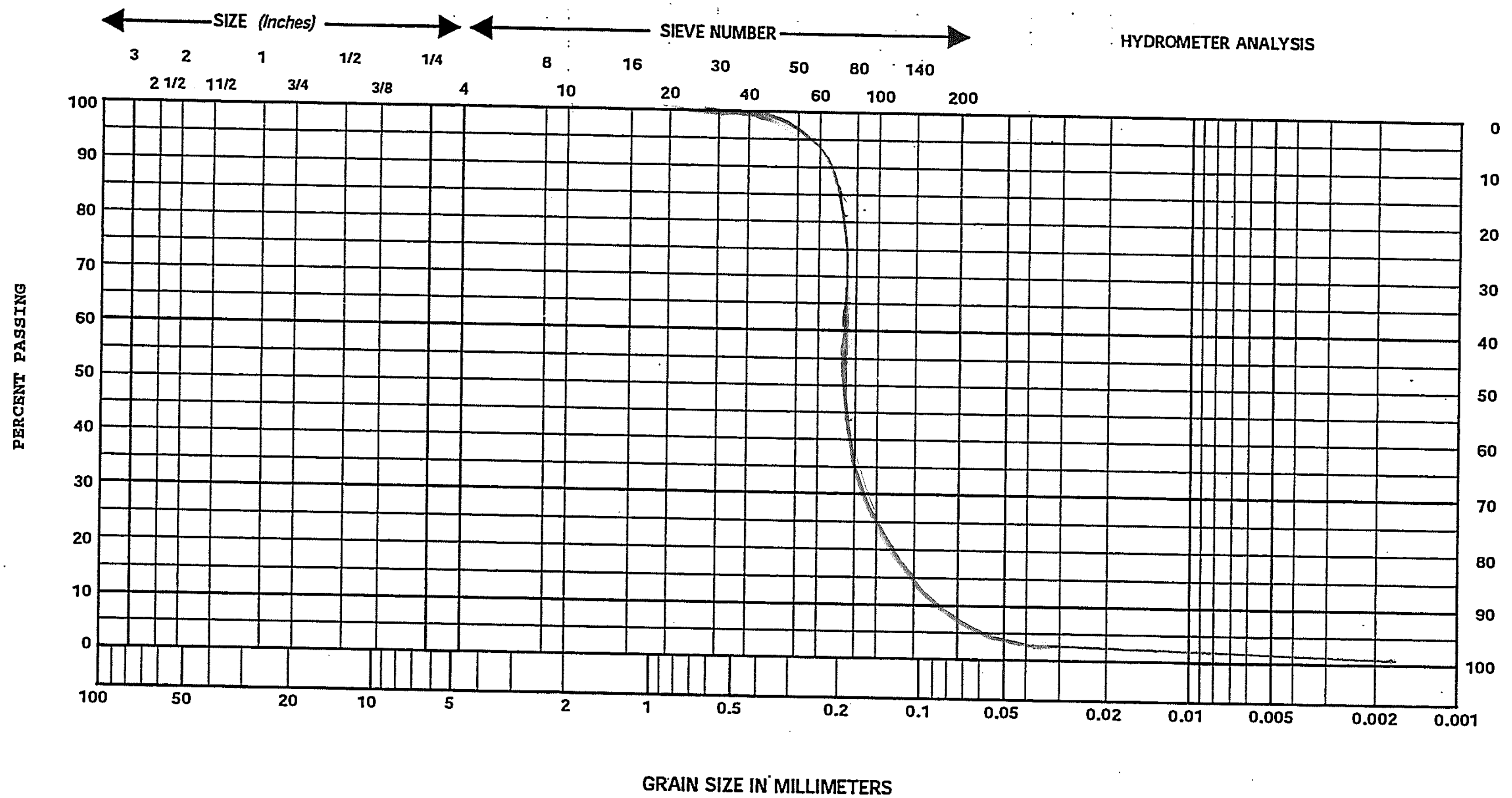
Date Completed:	: January 4, 2021
Logged By:	: D. Csanda
Drilled By:	: M. Hynes
Drilling Method:	: HSA (Mobile B-47 HD)
Total Depth:	: 6 feet

Depth in Feet	Surf. Elev. -16.00	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-16	Brown, saturated, medium dense, fine to medium SAND, with trace silt		SP	1	3-4-5-6	Scale 1" ~ 3 feet No organic bearing soil was encountered at the ground surface. Water Depth: 13.0 ft.
2	-18				2	7-5-6-8	Laboratory Test Results Sample No. 2 From 2 to 4 feet
4	-20	Brown to gray, satuarated, dense, fine to medium SAND, with trace silt, trace shells		SP	3	11-14-17-19	Hydrometer Analysis (See Graph) USCS: SP Natural Moisture = 23.1%
6	-22	Boring terminated at 6 feet.					NAD 83 VA State Plane South Easting: 12373364 Northing: 3861342 The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
8	-24						
10	-26						
12	-28						
14	-30						
16	-32						
18	-34						
20							

GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT Wallops Island M95 Intermodal Barge Service

2. DATE 1/25/21



EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc $(D_{30})^2/(D_{60} \times D_{10})$	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
E2	S2	NP	NP	NP				SP

3. TECHNICIAN *(Signature)* Joe Lowe

4. PLOTTED BY *(Signature)*

5. CHECKED BY *(Signature)*

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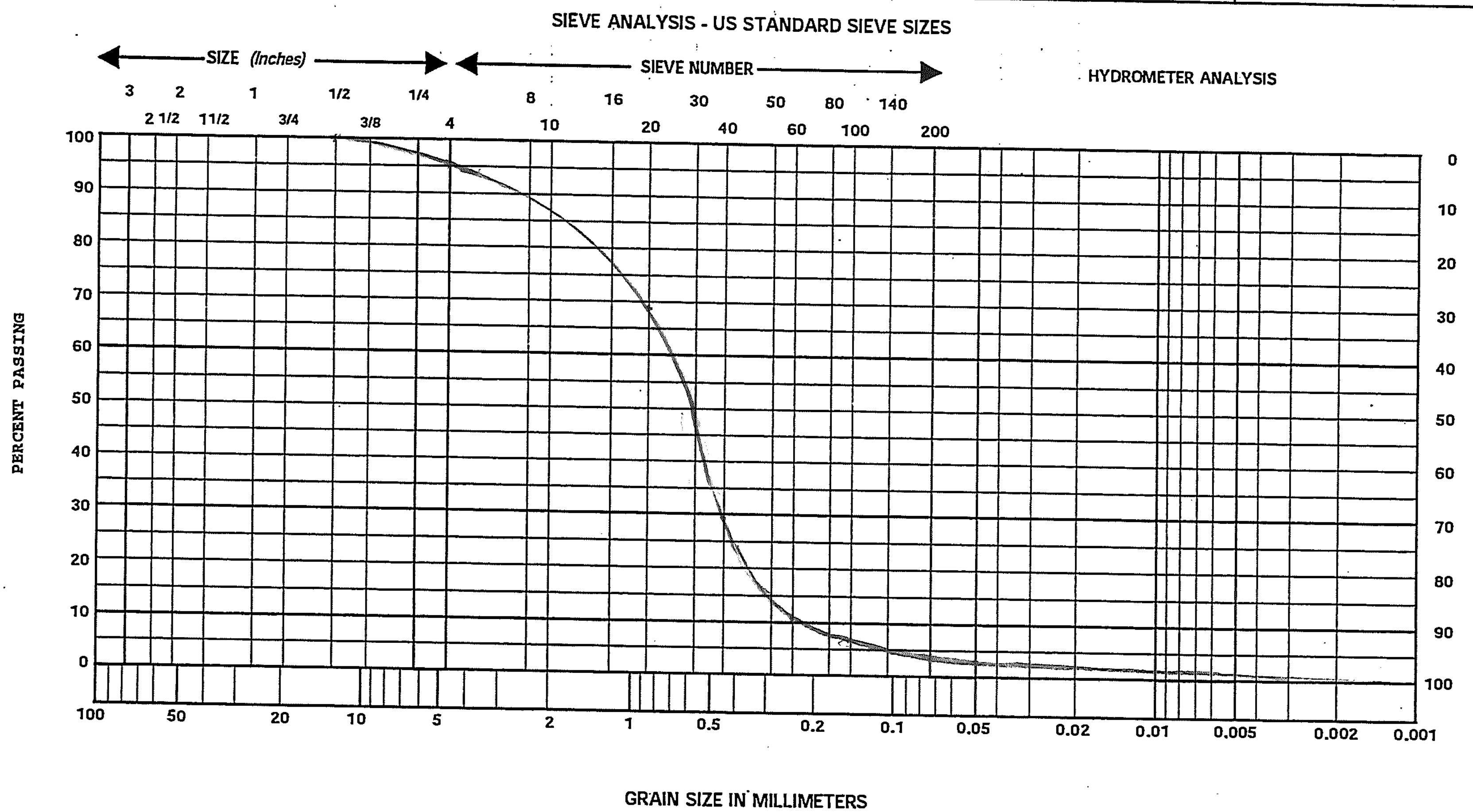
GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT Wallops Island M95 Intermodal Barge Service

2. DATE 1/25/21



EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc $(D_{30})^2/(D_{60} \times D_{10})$	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
E4	S4	NP	NP	NP				SP

3. TECHNICIAN (Signature) Joe Long

4. PLOTTED BY (Signature)

5. CHECKED BY (Signature)

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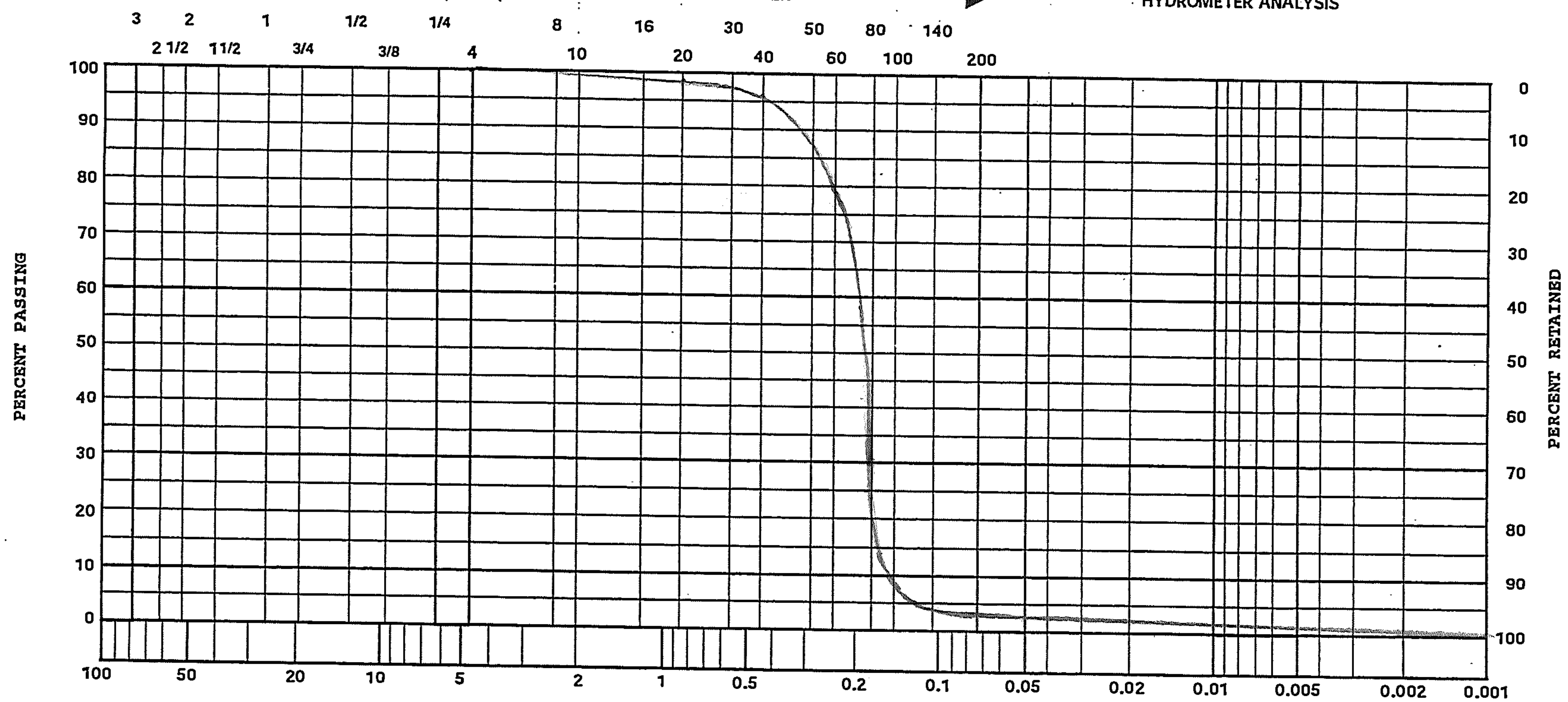
GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT	2. DATE
Wallops Island M95 Intermodal Barge Service	1/25/21



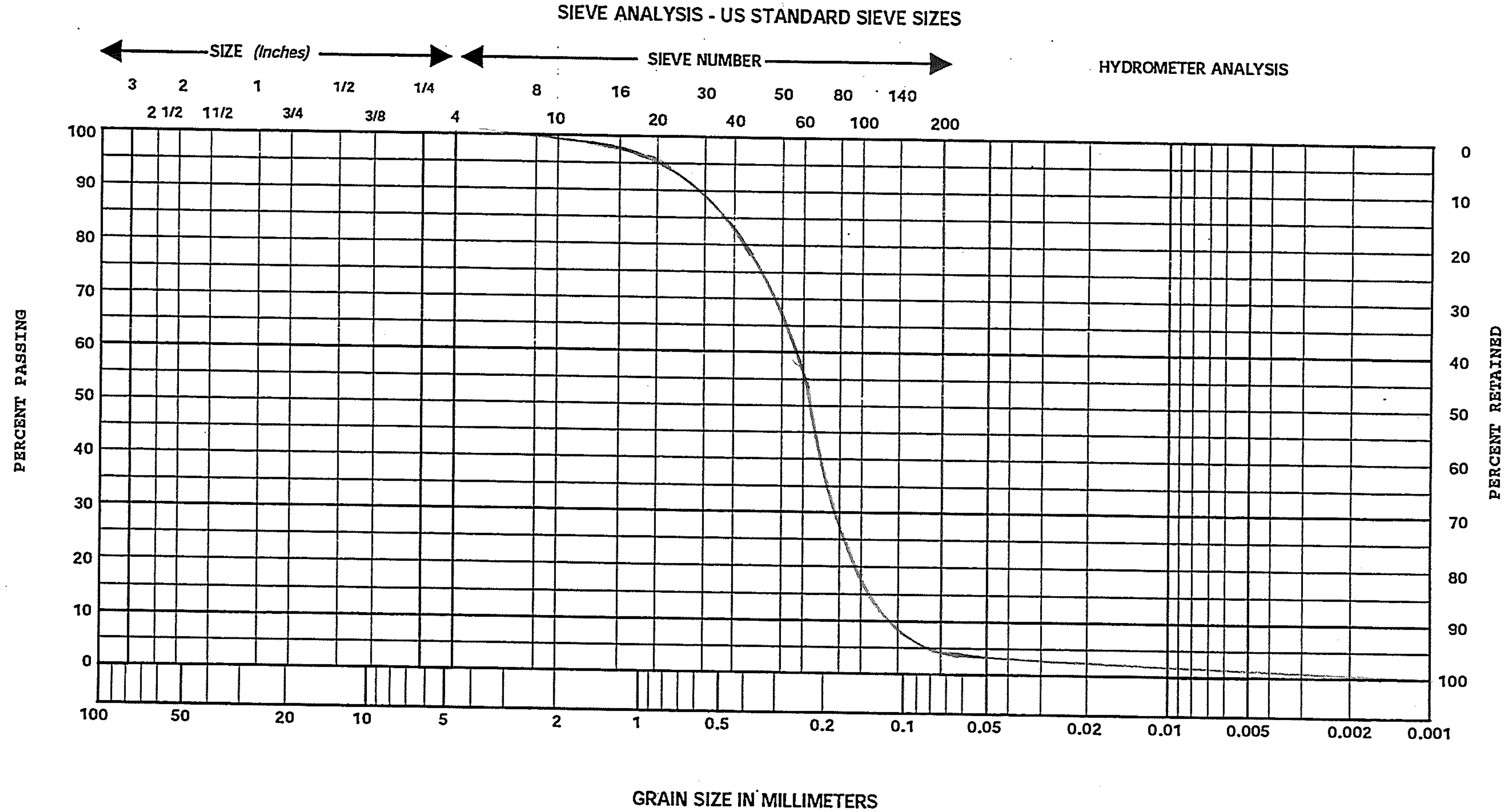
EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc $(D_{30})^2/(D_{60} \times D_{10})$	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
E7	S2	NP	NP	NP				SP

3. TECHNICIAN (Signature)	4. PLOTTED BY (Signature)	5. CHECKED BY (Signature)
JK Long		

GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT Wallops Island Intermodal Barge Service

2. DATE 1/25/21



EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc $(D_{30})^2/(D_{60} \times D_{10})$	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
D2	S5	NP	NP	NP				SP

3. TECHNICIAN (Signature) Joe Long

4. PLOTTED BY (Signature)

5. CHECKED BY (Signature)

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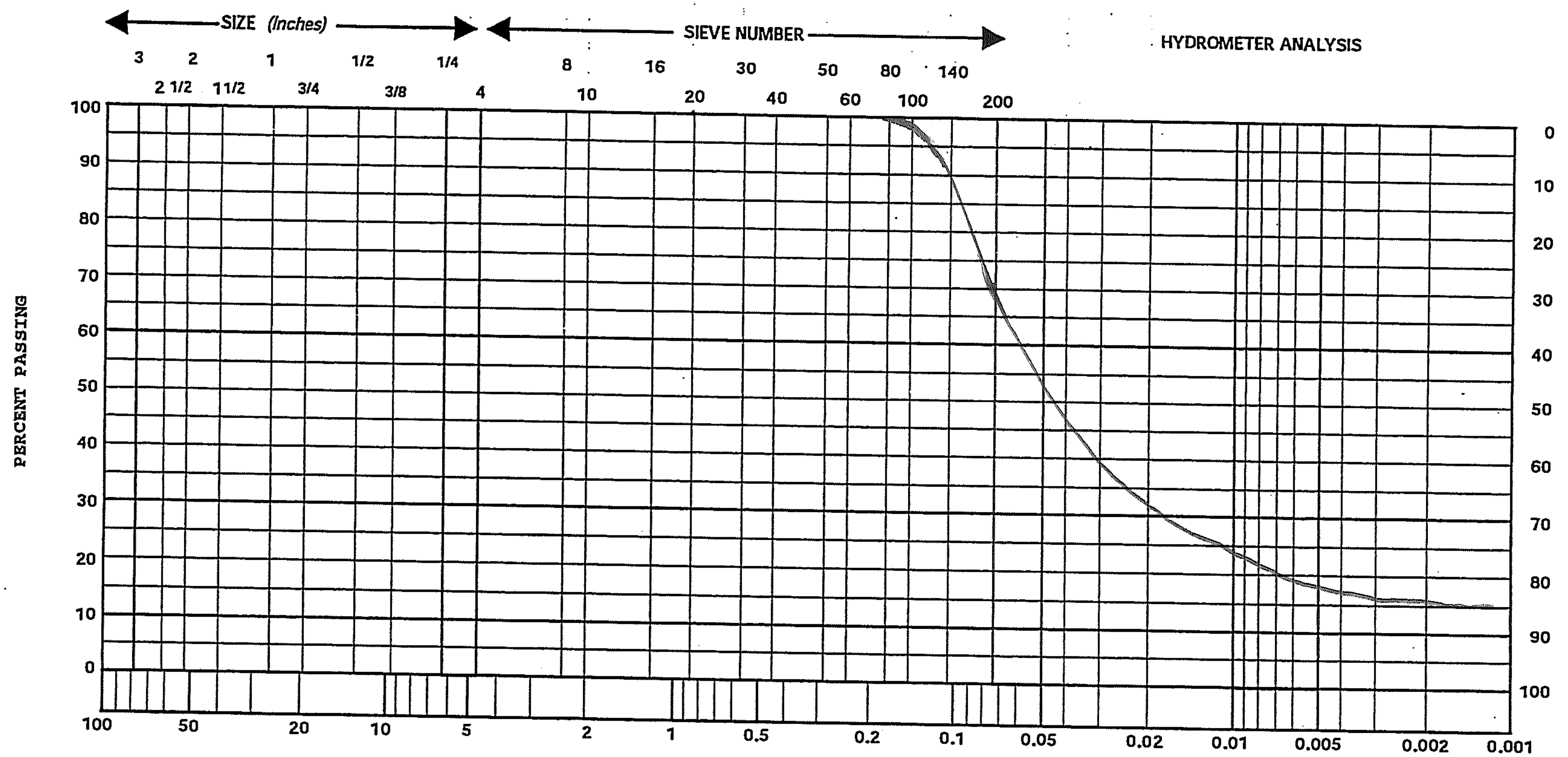
GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT Wallops Island M95 Intermodal Barge Service

2. DATE 1/25/21

SIEVE ANALYSIS - US STANDARD SIEVE SIZES



EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc $(D_{30})^2/(D_{60} \times D_{10})$	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
D4	S5	—	—	—				ML

3. TECHNICIAN (Signature) Joe Long

4. PLOTTED BY (Signature)

5. CHECKED BY (Signature)

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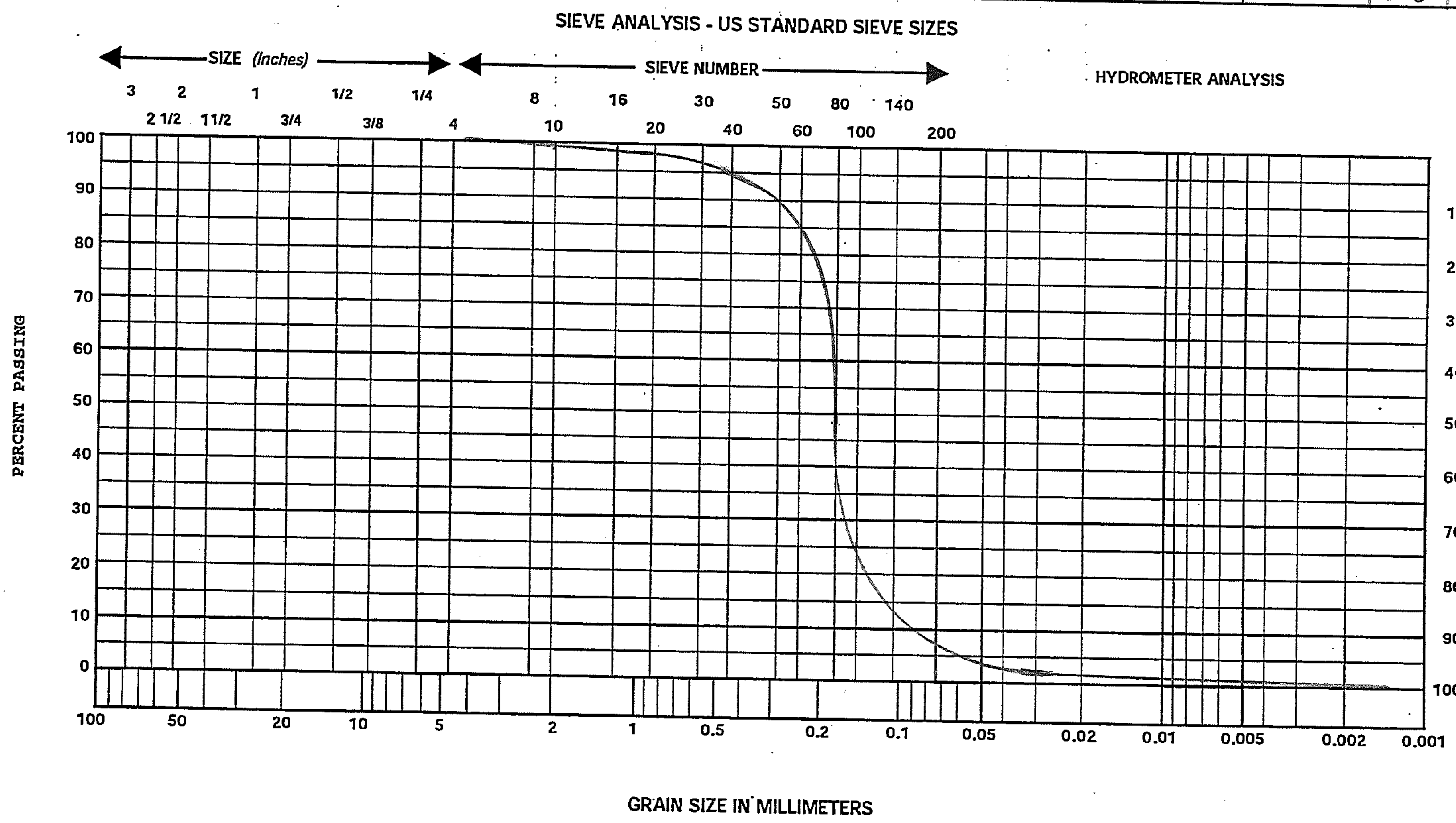
GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT Wallops Island M95 Intermodal Barge Service

2. DATE 1/25/24



EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc $(D_{30})^2/(D_{60} \times D_{10})$	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
D6	S1	NP	NP	NP				SP

3. TECHNICIAN (Signature)

4. PLOTTED BY (Signature)

5. CHECKED BY (Signature)

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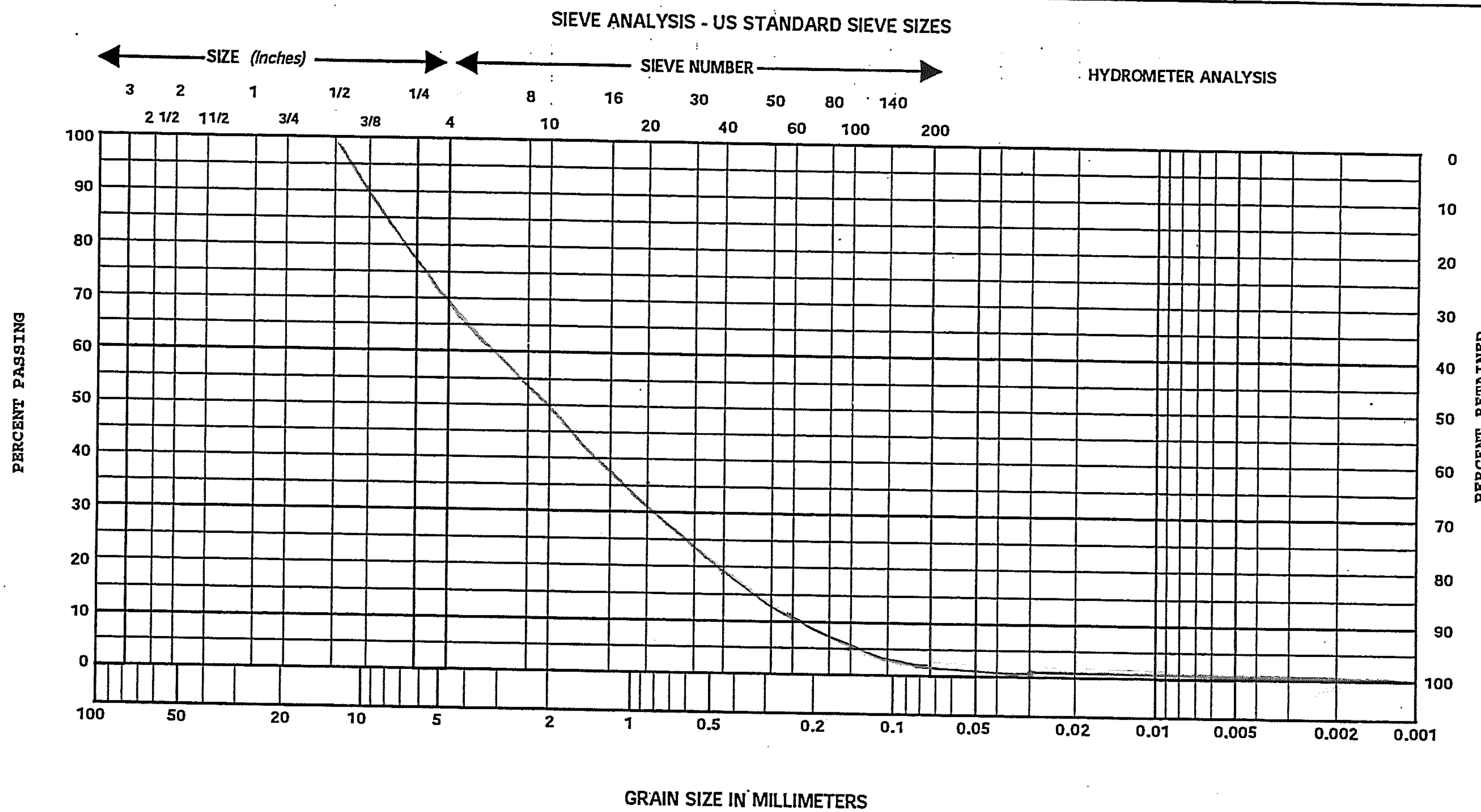
GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT Wallops Island MQS Intermodal Barge Service

2. DATE 1/29/21



EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc $(D_{30})^2/(D_{60} \times D_{10})$	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
D6	S3	NP	NP	NP				SP

3. TECHNICIAN (Signature)	4. PLOTTED BY (Signature)	5. CHECKED BY (Signature)
Joe Lowy		

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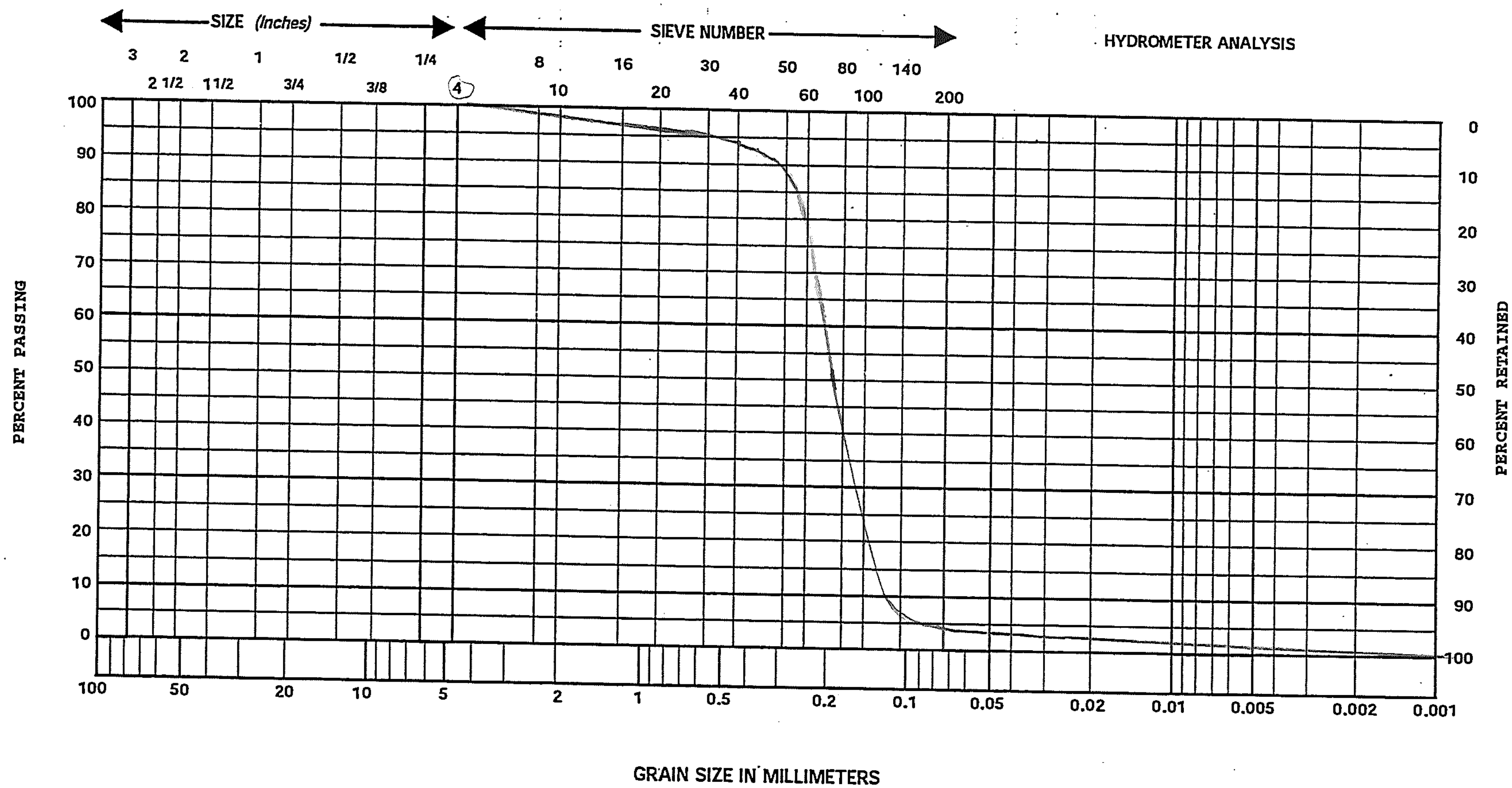
GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT Wallops Island M95 Intermodal Barge Services

2. DATE 1/29/21

SIEVE ANALYSIS - US STANDARD SIEVE SIZES



EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc $(D_{30})^2/(D_{60} \times D_{10})$	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
D9	S7	NP	NP	NP				SP

3. TECHNICIAN *(Signature)* Jos Lony

4. PLOTTED BY *(Signature)*

5. CHECKED BY *(Signature)*

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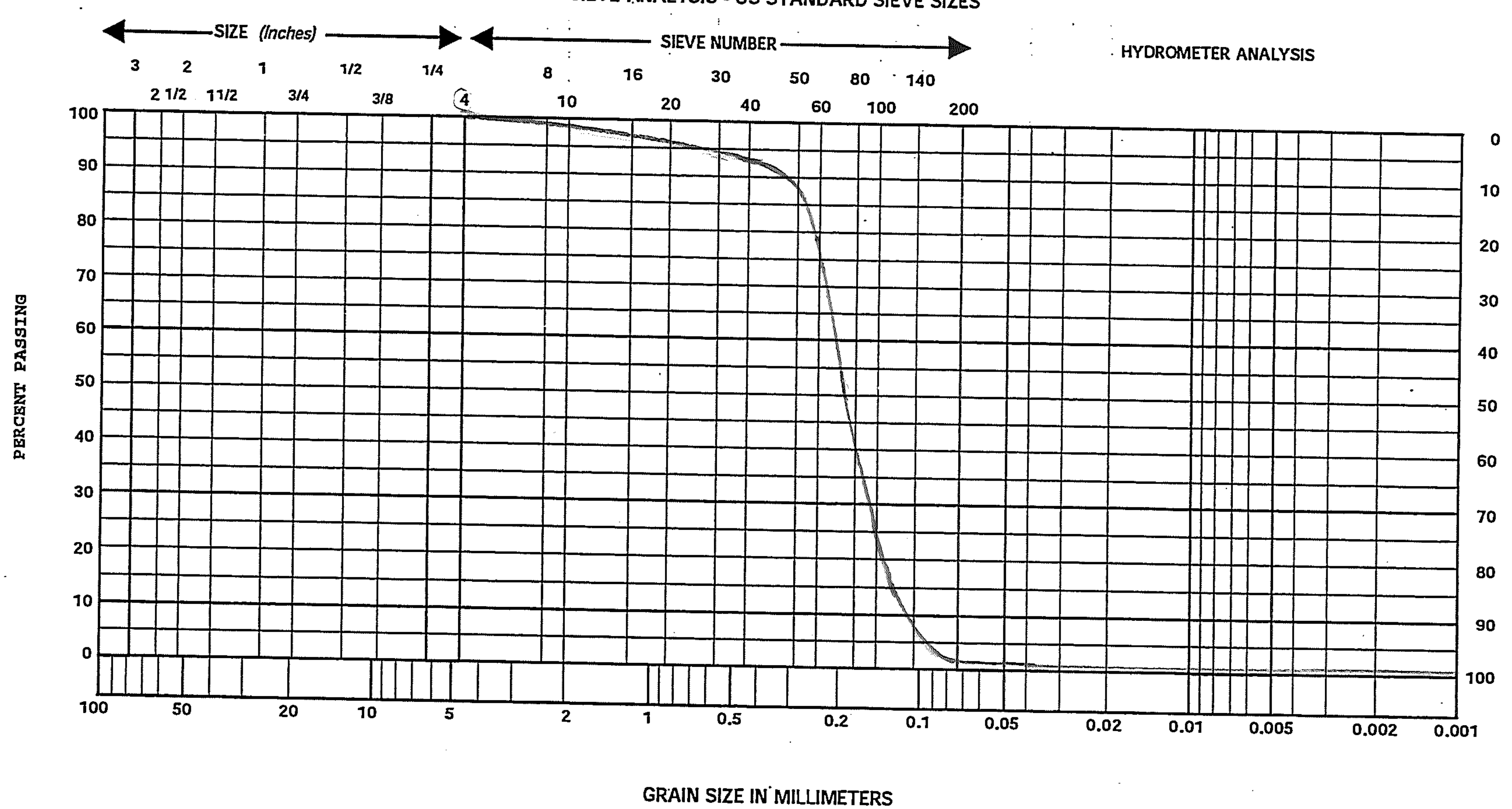
GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT Wallops Island M95 Intermodal Barge Service

2. DATE 1/29/21



EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc $(D_{30})^2/(D_{60} \times D_{10})$	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
D11	S5	NP	NP	NP				SP

3. TECHNICIAN *(Signature)* Joe Long

4. PLOTTED BY *(Signature)*

5. CHECKED BY *(Signature)*

DD FORM 1207, DEC 1999

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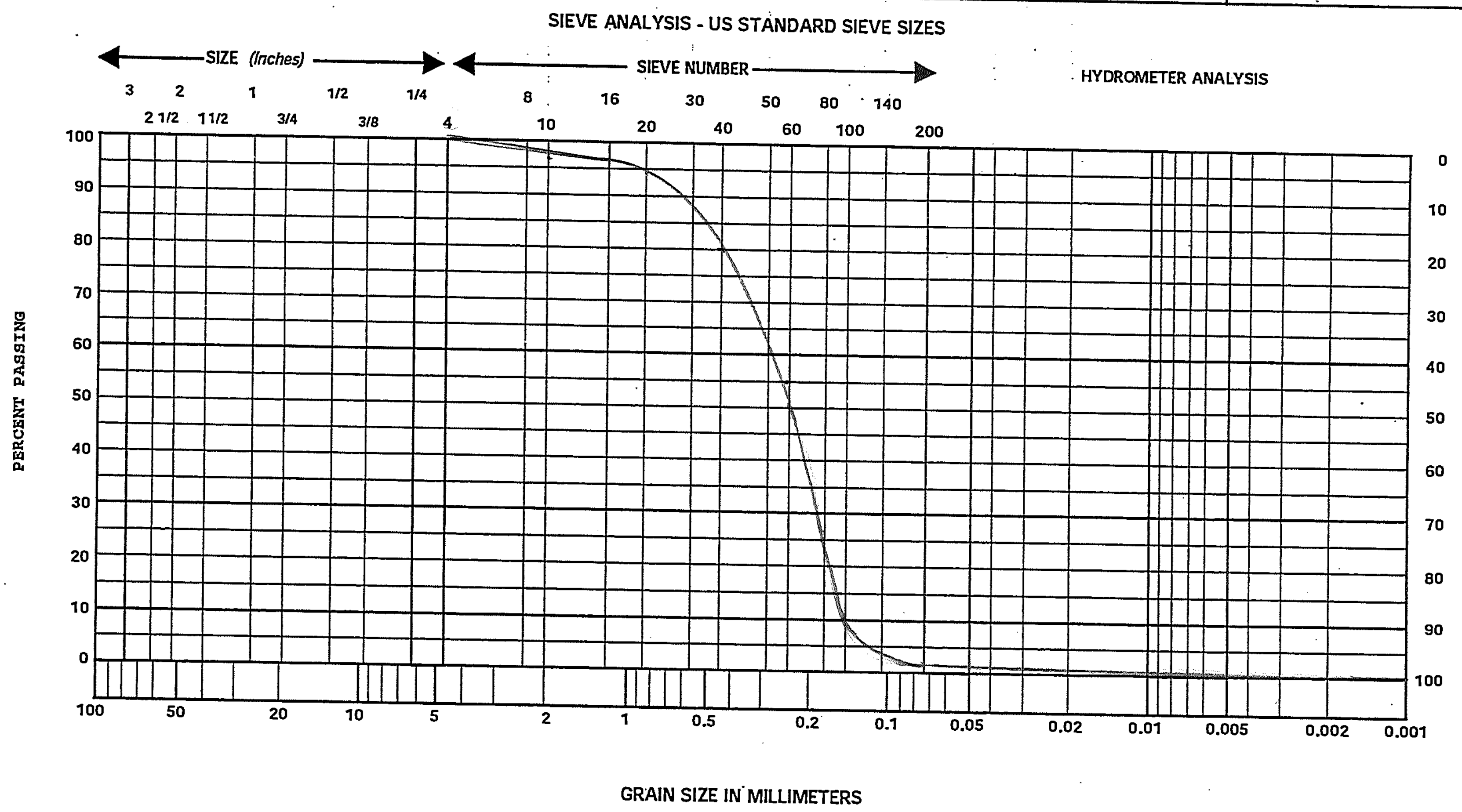
GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT Wallops Island M95 Intermodal Barge Service

2. DATE 1/25/21



EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc $(D_{30})^2/(D_{60} \times D_{10})$	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
D15	S5	NP	NP	NP				SP

3. TECHNICIAN (Signature) Joe Lo[illegible]

4. PLOTTED BY (Signature)

5. CHECKED BY (Signature)

DD FORM 1207, ~~DEC 1999~~

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EBA ENGINEERING

Project: Wallops Island M-95 Intermodal

Client: John D Hynes & Associates, Inc. **Purchase Order #** 13363

EBA Project Number: 4629-00-035

SOIL TESTING SUMMARY

Boring No.	JDH Sample Date	Depth (ft)	Specific Gravity	Moisture Content	Atterberg Limits		Dry Unit Weight
			AASHTO T100	ASTM D2166	ASTM D4813		ASTM D7262
				%	LL	PL	pcf
L-1	11/13/2020	22'-24'	2.672	26.1	NP	NP	98.0

Submitted by: Rita Patel

EBA Laboratory Chief Technician

EBA
ENGINEERING

Project: Wallops Island M-95 Intermodal

Client: John D Hynes & Associates, Inc. **Purchase Order #** 13398

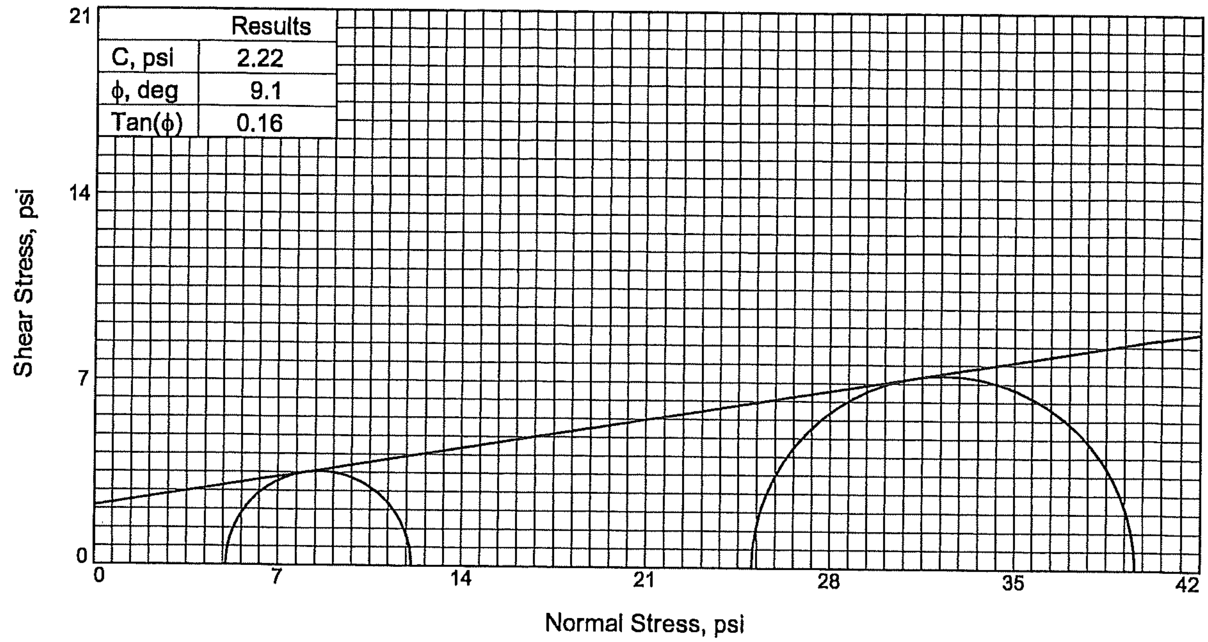
EBA Project Number: 4629-00-035

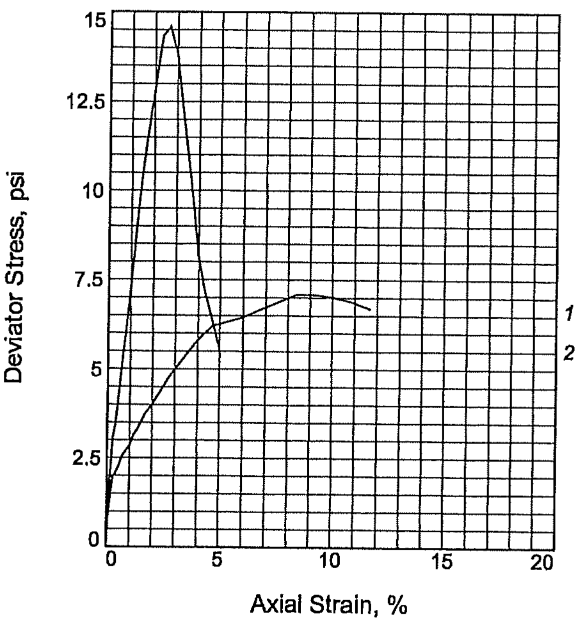
SOIL TESTING SUMMARY

Boring No.	JDH Sample Date	Depth (ft)	Specific Gravity	Moisture Content	Atterberg Limits		Dry Unit Weight
			AASHTO T100	ASTM D2166	ASTM D4813		ASTM D7262
				%	LL	PL	pcf
P-5	12/21/2020	42'-44'	2.714	42.6	36	17	78.6

Submitted by: Rita Patel

EBA Laboratory Chief Technician





	Sample No.	1	2
Initial	Water Content, %	41.5	36.7
	Dry Density, pcf	78.6	83.8
	Saturation, %	97.5	97.6
	Void Ratio	1.1563	1.0211
	Diameter, in.	2.89	2.86
	Height, in.	6.00	6.02
At Test	Water Content, %	42.6	37.6
	Dry Density, pcf	78.6	83.8
	Saturation, %	100.0	100.0
	Void Ratio	1.1563	1.0211
	Diameter, in.	2.89	2.86
	Height, in.	6.00	6.02
	Strain rate, in./min.	0.045	0.045
	Back Pressure, psi	0.0	0.0
	Cell Pressure, psi	5.0	25.0
	Fail. Stress, psi	7.1	14.6
	Ult. Stress, psi		
	σ_1 Failure, psi	12.1	39.6
	σ_3 Failure, psi	5.0	25.0

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed Shelby tube
Description: Visual classification: sandy lean clay

LL= 36 **PL=** 17 **PI=** 19
Specific Gravity= 2.714
Remarks: Date tested: 12/29/2020

Figure ________

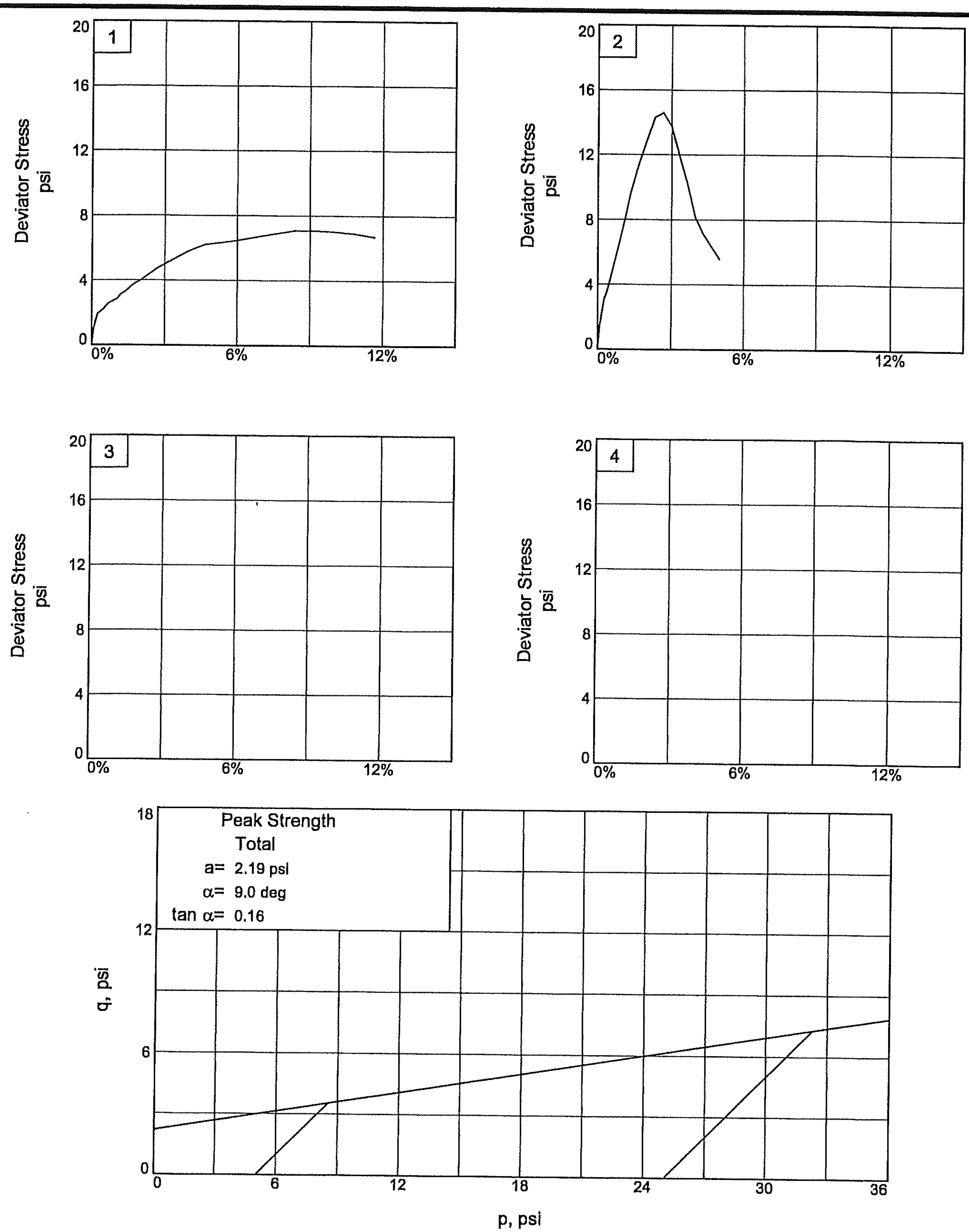
Client: JDH

Project: Wallops Island M-95 Intermodal

Source of Sample: P-5 **Depth:** 42'-44'
Sample Number: P-5
Proj. No.: 4629-00-035 **Date Sampled:** 12/21/2020

TRIAXIAL SHEAR TEST REPORT
EBA Engineering, Inc.
Laurel, MD

Tested By: RD **Checked By:** JK



Client: JDH
Project: Wallops Island M-95 Intermodal
Source of Sample: P-5 **Depth:** 42'-44' **Sample Number:** P-5
Project No.: 4629-00-035 **Figure** ________

EBA Engineering, Inc.

Tested By: RD **Checked By:** JK

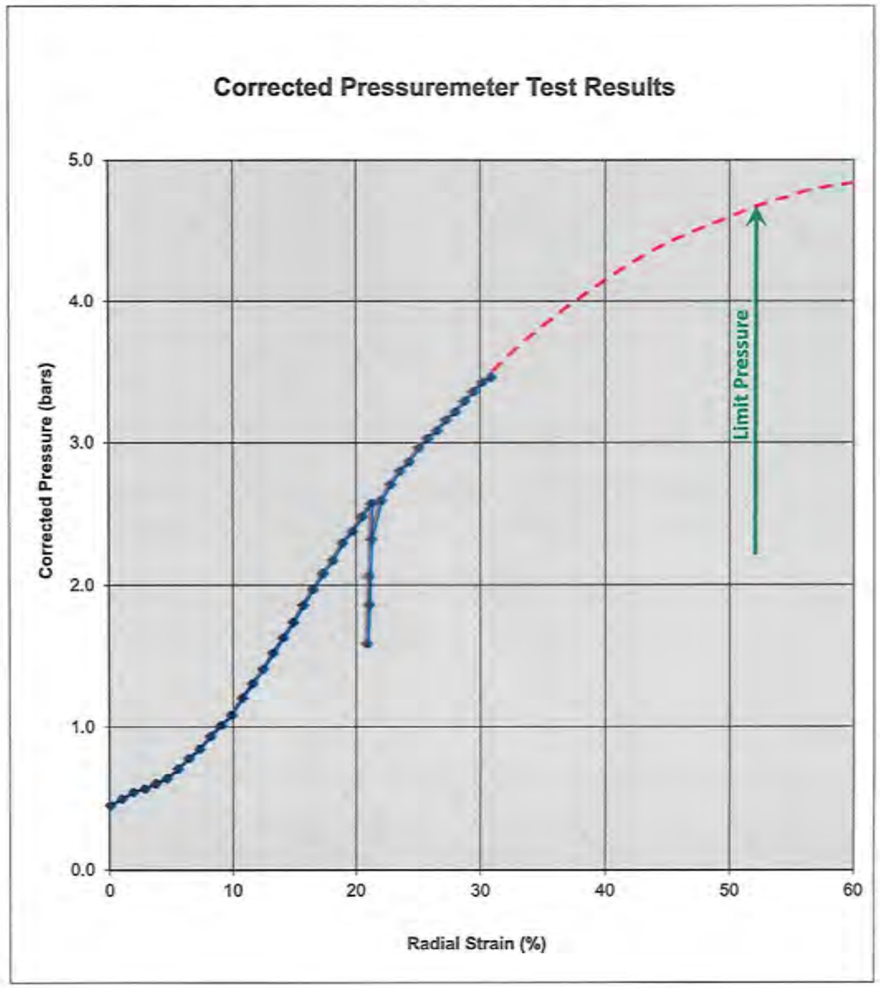
PRESSUREMETER TEST REPORT

PROJECT:	Wallops Island Northern Development	BORING:	P-2
LOCATION:	Wallops Island, Virginia	TEST #:	1
IN-SITU SOIL TESTING, L.C.		DEPTH:	12.9 ft
ENGINEER:	Roger A. Failmezger, P.E., F. ASCE, D GE	TEST DATE:	December 29, 2020

Note: ***Depth*** refers to the distance from the ground surface to center of NX Probe.

Pressure Bar	Volume cm³	ΔR/R₀ %	Selected
0.45	0	0.00	
0.50	40	0.93	
0.55	80	1.85	
0.57	120	2.76	
0.61	160	3.67	
0.64	200	4.56	
0.71	240	5.45	
0.78	280	6.33	
0.85	319	7.21	
0.93	359	8.08	
1.01	399	8.94	
1.08	439	9.79	
1.21	479	10.64	
1.31	519	11.48	
1.41	559	12.31	
1.52	599	13.14	
1.63	639	13.96	
1.74	679	14.78	E0a
1.86	719	15.59	
1.97	759	16.39	
2.08	799	17.19	
2.17	839	17.99	
2.30	878	18.77	E0b
2.38	918	19.56	
2.48	958	20.34	
2.57	998	21.11	E1a
1.86	989	20.92	
1.59	979	20.73	E1b
2.06	989	20.92	
2.32	998	21.11	E1c
2.59	1038	21.88	
2.71	1078	22.64	
2.80	1118	23.40	
2.87	1158	24.15	
2.96	1198	24.90	
3.03	1238	25.65	
3.08	1278	26.39	
3.16	1318	27.13	
3.22	1358	27.86	
3.29	1398	28.59	
3.36	1438	29.31	
3.42	1478	30.03	
3.46	1518	30.75	

Interpreted Pressuremeter Parameters			
	P_o	0.8	bar
	Limit Pressure Strain	52.0%	
	P_L	4.7	bar
	P_L^*	3.9	bar
	E_o	22	bar
	E_o/P_L^*	5.6	bar
Loop #	Unload Modulus	Reload Modulus	
1	422	313	bar
2	#DIV/0!	#DIV/0!	bar
3	#DIV/0!	#DIV/0!	bar



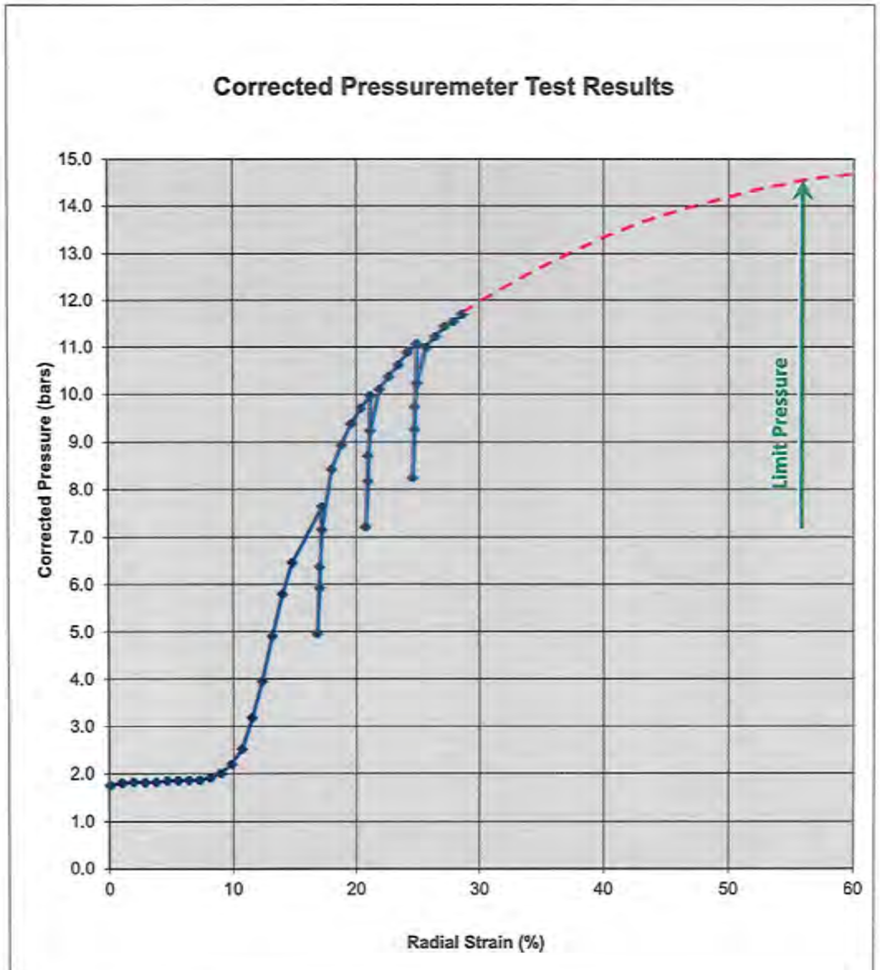
PRESSUREMETER TEST REPORT

PROJECT: Wallops Island Northern Development		BORING:	P-2
LOCATION: Wallops Island, Virginia		TEST #:	1
IN-SITU SOIL TESTING, L.C.		DEPTH:	55.5 ft
ENGINEER: Roger A. Failmezger, P.E., F. ASCE, D GE		TEST DATE:	December 29, 2020

Note: ***Depth*** refers to the distance from the ground surface to center of NX Probe.

Pressure Bar	Volume cm^3	$\Delta R/R_o$ %	Selected
1.76	0	0.00	
1.81	40	0.93	
1.83	80	1.85	
1.82	120	2.76	
1.83	160	3.67	
1.85	200	4.56	
1.86	240	5.46	
1.86	280	6.34	
1.87	320	7.21	
1.92	360	8.08	
2.00	400	8.94	
2.20	439	9.79	
2.52	479	10.64	
3.18	519	11.47	
3.96	558	12.30	E0a
4.91	598	13.11	
5.80	637	13.92	E0b
6.46	677	14.73	
7.63	796	17.14	E1a
5.94	787	16.95	
4.97	777	16.77	E1b
6.37	787	16.95	
7.15	796	17.14	E1c
8.43	835	17.92	
8.94	875	18.70	
9.38	915	19.48	
9.70	954	20.26	
9.97	994	21.03	E2a
8.18	985	20.86	
7.22	976	20.68	E2b
8.71	985	20.85	
9.23	995	21.04	E2c
10.11	1034	21.80	
10.38	1074	22.56	
10.62	1114	23.32	
10.89	1154	24.07	
11.06	1194	24.82	E3a
9.27	1184	24.65	
8.25	1175	24.48	E3b
9.74	1184	24.65	
10.23	1194	24.83	E3c
10.99	1234	25.57	
11.22	1273	26.31	
11.43	1313	27.04	
11.54	1353	27.78	
11.69	1393	28.50	

	Interpreted Pressuremeter Parameters		
	P_o	2.0	bar
	Limit Pressure Strain	55.8%	
	P_L	14.5	bar
	P_L^*	12.5	bar
	E_o	170	bar
	E_o/P_L^*	13.6	bar
Loop #	Unload Modulus	Reload Modulus	
1	1123	906	bar
2	1244	887	bar
3	1355	929	bar

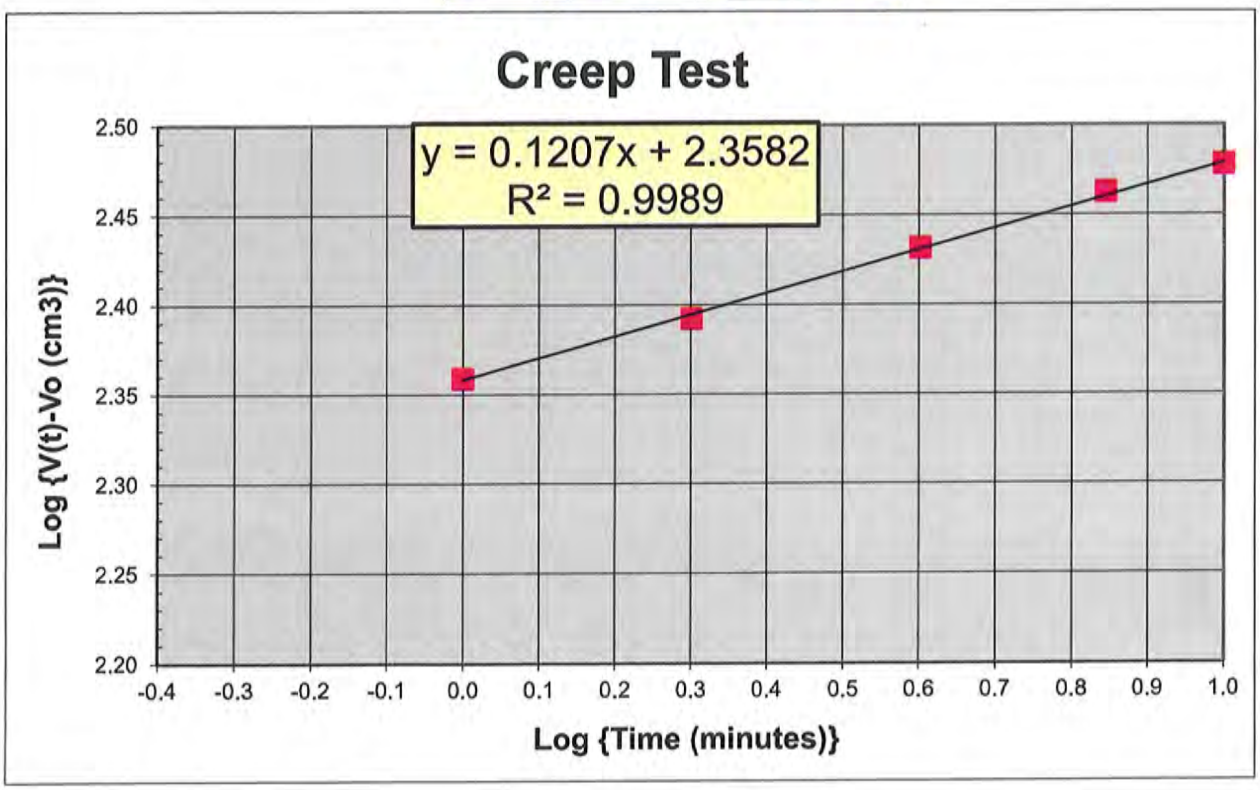


Pressuremeter Creep Test

Project: Wallops Island Northern Development
Sounding No.: P-2
Test Depth: 55.5 feet
Holding Gauge Pressure = 5.15 bars
Corrected Pressure = 6.42 bars
Initial Probe Radius = 3.69 cm
Initial Probe Length = 50 cm
Initial Volume of Probe = 2139 cm^3
Probe Radius Contacting Borehole = 4.08 cm
Initial Borehole Volume, Vo = 2612 cm^3

Time (minutes)	Log (Time) (minutes)	Volume Increase (cm^3)	Total Probe Volume (cm^3)	$V(t)-V_0$ (cm^3)	Log $[V(t)-V_0]$ (cm^3)
1	0.000	701.38	2840.19	228.65	2.359
2	0.301	719.65	2858.46	246.92	2.393
4	0.602	742.73	2881.54	270.00	2.431
7	0.845	762.58	2901.39	289.85	2.462
10	1.000	773.07	2911.88	300.34	2.478

$E_0(t)/E_0(t{=}1\ min) = \{t/1\}^{-n}$
n = 0.1207

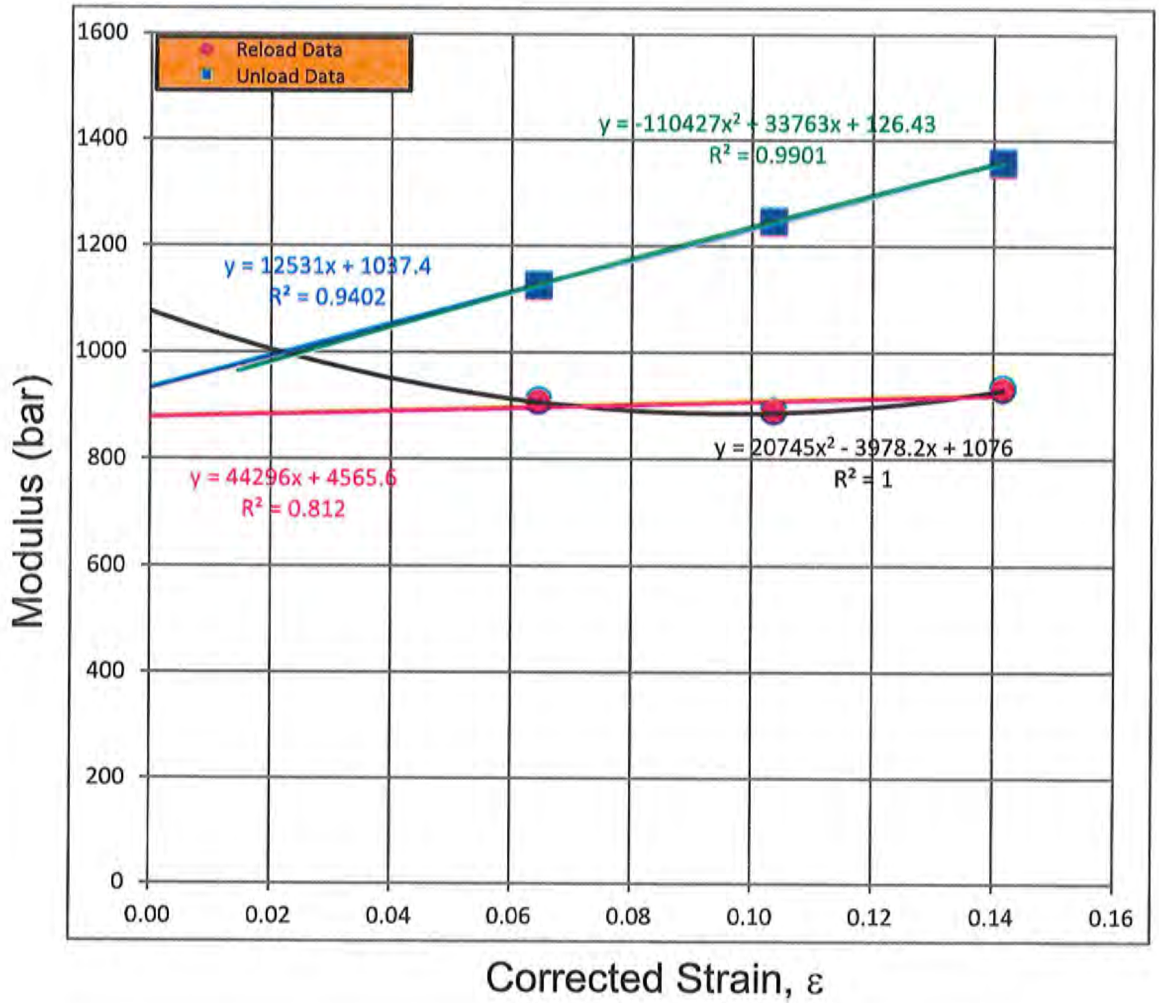


RELOAD/UNLOAD MODULUS ANALYSES

PROJECT:	Wallops Island Northern Development	BORING:	P-2
LOCATION:	Wallops Island, Virginia	TEST #:	1
IN-SITU SOIL TESTING, L.C.		DEPTH:	55.5 ft
ENGINEER:	Roger A. Failmezger, P.E., F. ASCE, D GE	TEST DATE:	12/29/2020

Strain to contact borehole = 0.105

Average Strain	Corrected Strain	Reload Modulus	Average Strain	Corrected Strain	Unload Modulus
0.1695	0.0645	906	0.1695	0.0645	1123
0.2086	0.1036	887	0.2085	0.1035	1244
0.2465	0.1415	929	0.2465	0.1415	1355



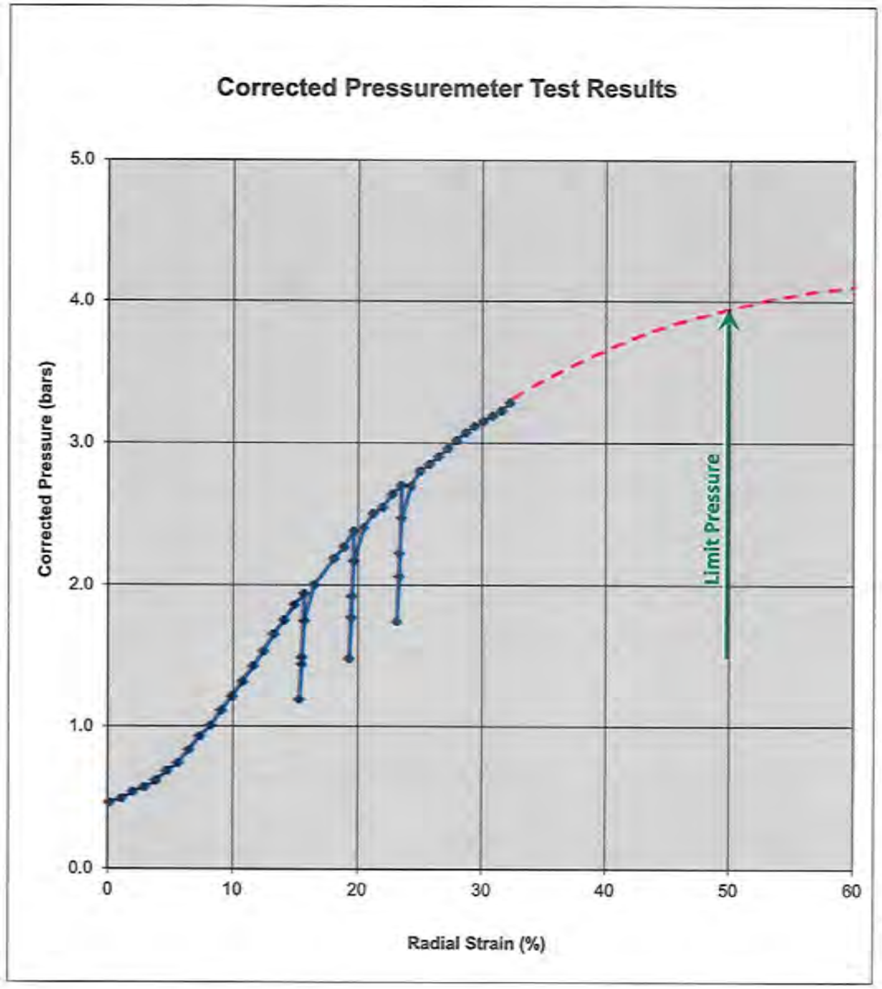
PRESSUREMETER TEST REPORT

PROJECT:	Wallops Island Northern Development	BORING:	P-2A
LOCATION:	Wallops Island, Virginia	TEST #:	1
IN-SITU SOIL TESTING, L.C.		DEPTH:	14.0 ft
ENGINEER:	Roger A. Failmezger, P.E., F. ASCE, D GE	TEST DATE:	December 30, 2020

Note: *Depth* refers to the distance from the ground surface to center of NX Probe.

Pressure Bar	Volume cm^3	$\Delta R/R_o$ %	Selected
0.46	0	0.00	
0.49	40	0.93	
0.54	80	1.85	
0.57	120	2.76	
0.62	160	3.67	
0.68	200	4.56	
0.74	240	5.45	
0.83	280	6.33	
0.93	319	7.21	
1.01	359	8.08	
1.11	399	8.94	
1.22	439	9.79	
1.32	479	10.64	
1.43	519	11.48	
1.53	559	12.31	E0a
1.65	599	13.14	
1.75	639	13.96	
1.86	679	14.78	E0b
1.94	719	15.59	E1a
1.44	709	15.39	
1.19	699	15.19	E1b
1.49	709	15.39	
1.75	719	15.59	E1c
2.00	759	16.39	
2.19	839	17.99	
2.27	879	18.78	
2.38	918	19.56	E2a
1.77	909	19.37	
1.48	899	19.18	E2b
1.92	909	19.37	
2.17	919	19.56	E2c
2.40	958	20.34	
2.50	998	21.11	
2.55	1038	21.88	
2.64	1078	22.64	
2.70	1118	23.40	E3a
2.06	1109	23.22	
1.74	1099	23.03	E3b
2.22	1109	23.22	
2.47	1118	23.41	E3c
2.70	1158	24.16	
2.80	1198	24.91	
2.85	1238	25.65	
2.91	1278	26.39	
2.96	1318	27.13	
3.02	1358	27.86	
3.07	1398	28.59	
3.12	1438	29.32	
3.16	1478	30.04	
3.19	1518	30.75	
3.23	1558	31.47	
3.28	1598	32.18	

Loop #	Interpreted Pressuremeter Parameters		
	P_o	0.8	bar
	Limit Pressure Strain	49.7%	
	P_L	3.9	bar
	P_L^*	3.1	bar
	E_o	20	bar
	E_o/P_L^*	6.5	bar
Loop #	Unload Modulus	Reload Modulus	
1	289	214	bar
2	373	283	bar
3	426	321	bar

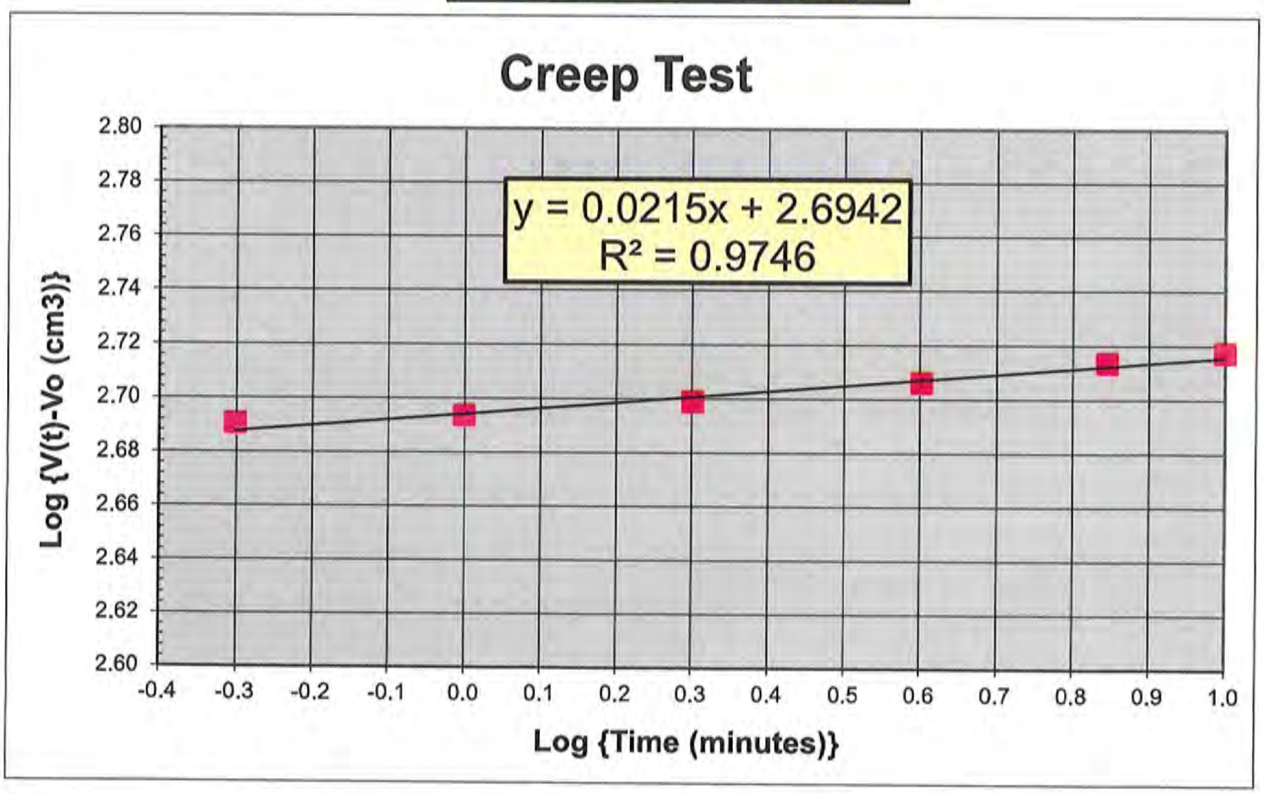


Pressuremeter Creep Test

Project: Wallops Island Northern Development
Sounding No.: P-2A
Test Depth: 14.0 feet
Holding Gauge Pressure = 1.95 bars
Corrected Pressure = 2.00 bars
Initial Probe Radius = 3.69 cm
Initial Probe Length = 50 cm
Initial Volume of Probe = 2139 cm^3
Probe Radius Contacting Borehole = 3.92 cm
Initial Borehole Volume, Vo = 2412 cm^3

Time (minutes)	Log (Time) (minutes)	Volume Increase (cm^3)	Total Probe Volume (cm^3)	$V(t)-V_0$ (cm^3)	Log $[V(t)-V_0]$ (cm^3)
0.5	-0.301	763.12	2901.93	489.69	2.690
1	0.000	766.85	2905.66	493.42	2.693
2	0.301	772.87	2911.68	499.44	2.698
4	0.602	781.23	2920.04	507.80	2.706
7	0.845	789.98	2928.79	516.55	2.713
10	1.000	794.72	2933.53	521.29	2.717

$E_0(t)/E_0(t=1\ min) = \{t/1\}^{-n}$
n = 0.0215

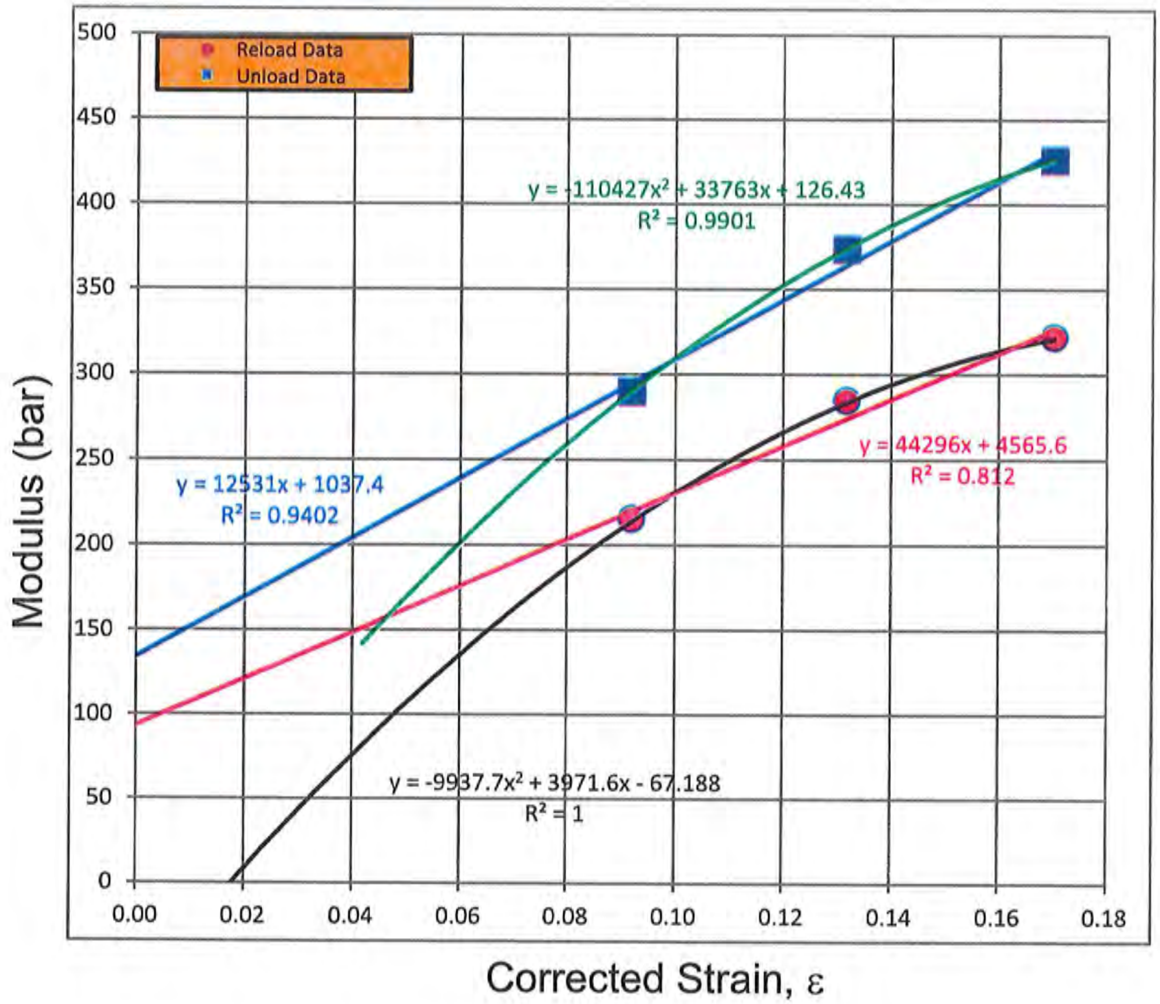


RELOAD/UNLOAD MODULUS ANALYSES

PROJECT:	Wallops Island Northern Development	BORING:	P-2A
LOCATION:	Wallops Island, Virginia	TEST #:	1
IN-SITU SOIL TESTING, L.C.		DEPTH:	14.0 ft
ENGINEER:	Roger A. Failmezger, P.E., F. ASCE, D GE	TEST DATE:	12/30/2020

Strain to contact borehole = 0.062

Average Strain	Corrected Strain	Reload Modulus	Average Strain	Corrected Strain	Unload Modulus
0.1539	0.0919	214	0.1539	0.0919	289
0.1937	0.1317	283	0.1937	0.1317	373
0.2322	0.1702	321	0.2322	0.1702	426



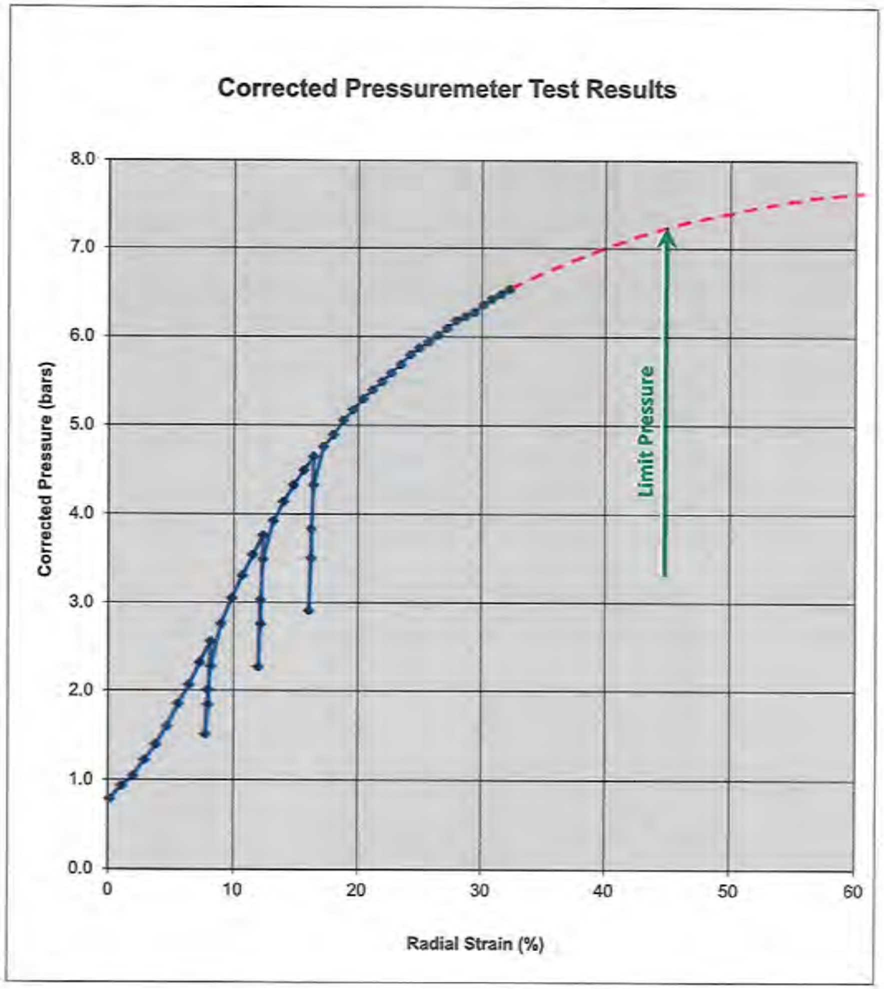
PRESSUREMETER TEST REPORT

PROJECT:	Wallops Island Northern Development	BORING:	P-2A
LOCATION:	Wallops Island, Virginia	TEST #:	2
IN-SITU SOIL TESTING, L.C.		DEPTH:	24.0 ft
ENGINEER:	Roger A. Failmezger, P.E., F. ASCE, D GE	TEST DATE:	December 30, 2020

Note: ***Depth*** refers to the distance from the ground surface to center of NX Probe.

Pressure Bar	Volume cm^3	$\Delta R/R_o$ %	Selected
0.78	0	0.00	
0.93	40	0.93	
1.04	80	1.85	
1.22	120	2.76	
1.40	159	3.66	
1.60	199	4.55	E0a
1.86	239	5.44	
2.07	279	6.32	
2.33	319	7.19	E0b
2.56	359	8.06	E1a
1.85	349	7.85	
1.51	339	7.64	E1b
2.02	349	7.85	
2.28	359	8.06	E1c
2.76	398	8.92	
3.05	438	9.77	
3.31	478	10.61	
3.54	518	11.45	
3.76	558	12.29	E2a
2.76	548	12.09	
2.27	539	11.89	E2b
3.03	548	12.09	
3.49	558	12.29	E2c
3.92	598	13.11	
4.14	638	13.93	
4.33	677	14.75	
4.50	717	15.56	
4.65	757	16.36	E3a
3.50	748	16.17	
2.91	738	15.98	E3b
3.83	748	16.17	
4.33	757	16.37	E3c
4.76	797	17.16	
4.89	837	17.95	
5.06	877	18.74	
5.18	917	19.53	
5.30	957	20.30	
5.40	997	21.08	
5.49	1037	21.85	
5.60	1077	22.61	
5.69	1116	23.37	
5.80	1156	24.12	
5.87	1196	24.87	
5.94	1236	25.62	
6.01	1276	26.36	
6.09	1316	27.10	
6.18	1356	27.83	
6.22	1396	28.56	
6.27	1436	29.28	
6.35	1476	30.00	
6.42	1516	30.72	
6.48	1556	31.43	
6.53	1596	32.14	

Loop #	Interpreted Pressuremeter Parameters		
	P_o	1.2	bar
	Limit Pressure Strain	44.5%	
	P_L	7.2	bar
	P_L^*	6.0	bar
	E_o	39	bar
	E_o/P_L^*	6.4	bar
Loop #	Unload Modulus	Reload Modulus	
1	360	262	bar
2	555	450	bar
3	702	566	bar

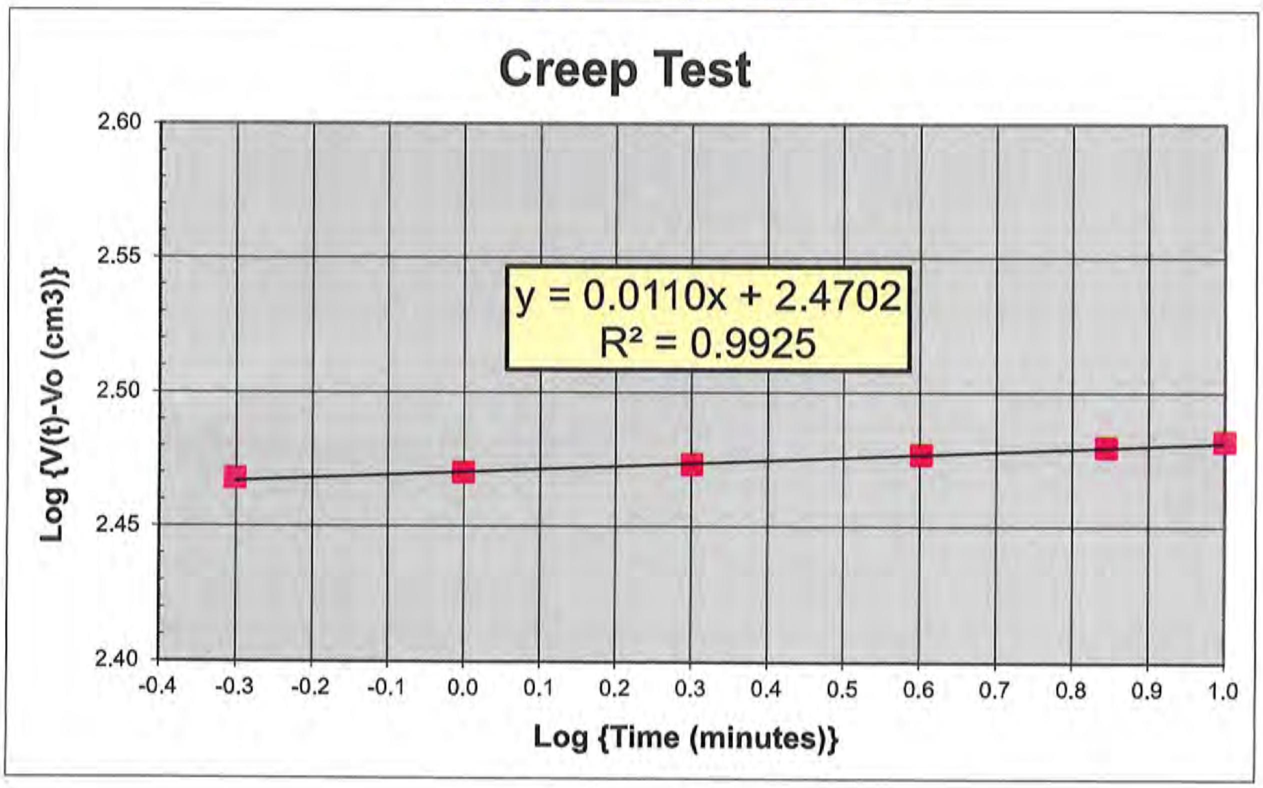


Pressuremeter Creep Test

Project: Wallops Island Northern Development
Sounding No.: P-2A
Test Depth: 24.0 feet
Holding Gauge Pressure = 2.33 bars
Corrected Pressure = 2.76 bars
Initial Probe Radius = 3.69 cm
Initial Probe Length = 50 cm
Initial Volume of Probe = 2139 cm^3
Probe Radius Contacting Borehole = 3.78 cm
Initial Borehole Volume, Vo = 2247 cm^3

Time (minutes)	Log (Time) (minutes)	Volume Increase (cm^3)	Total Probe Volume (cm^3)	$V(t)-V_0$ (cm^3)	Log $[V(t)-V_0]$ (cm^3)
0.5	-0.301	401.73	2540.54	293.45	2.468
1	0.000	403.28	2542.09	295.00	2.470
2	0.301	405.41	2544.22	297.13	2.473
4	0.602	407.93	2546.74	299.65	2.477
7	0.845	409.85	2548.66	301.57	2.479
10	1.000	411.44	2550.25	303.16	2.482

$E_0(t)/E_0(t=1\text{ min}) = \{t/1\}^{-n}$
n = 0.0110

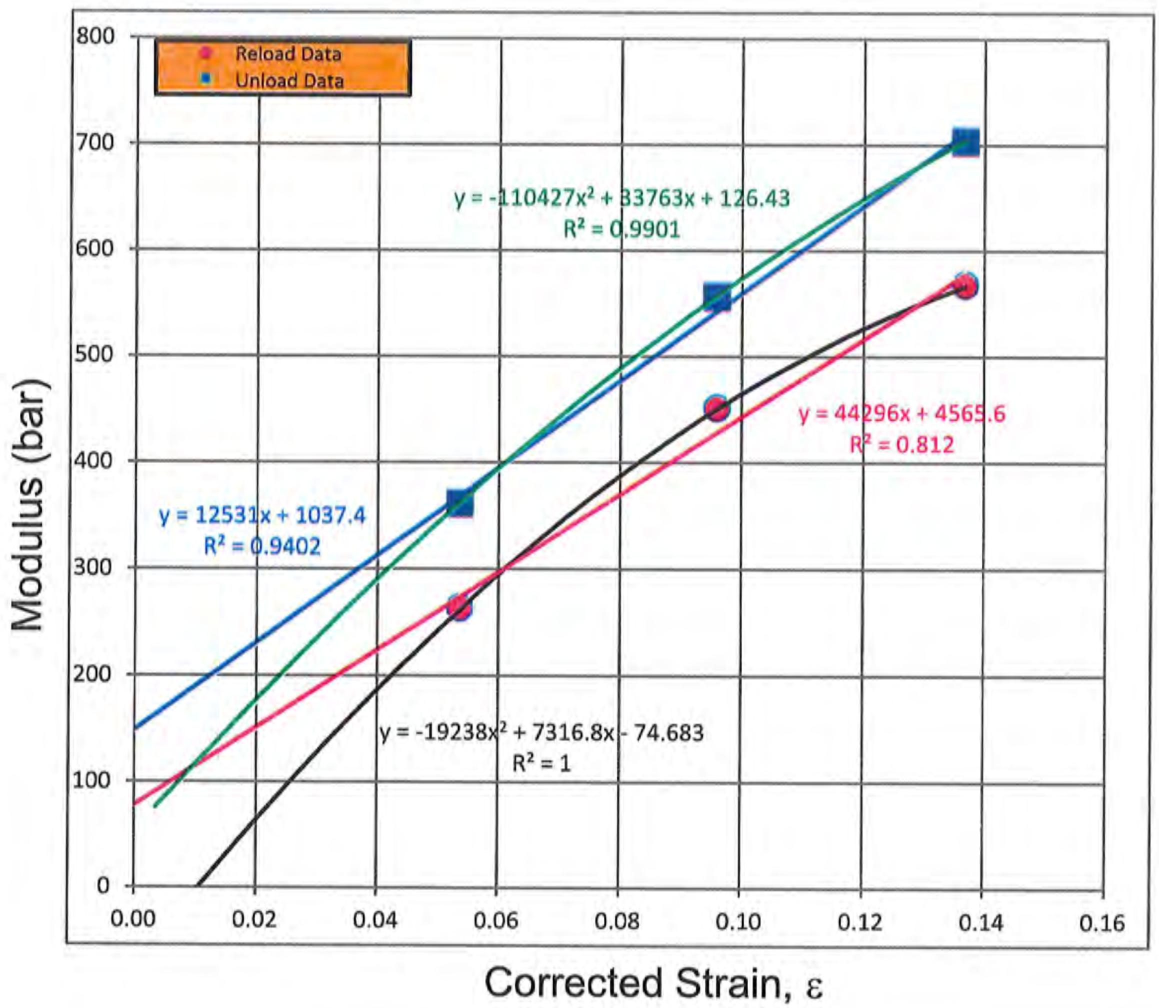


RELOAD/UNLOAD MODULUS ANALYSES

PROJECT:	Wallops Island Northern Development	BORING:	P-2A
LOCATION:	Wallops Island, Virginia	TEST #:	2
IN-SITU SOIL TESTING, L.C.		DEPTH:	24.0 ft
ENGINEER:	Roger A. Failmezger, P.E., F. ASCE, D GE	TEST DATE:	12/30/2020

Strain to contact borehole = 0.025

Average Strain	Corrected Strain	Reload Modulus	Average Strain	Corrected Strain	Unload Modulus
0.0785	0.0535	262	0.0785	0.0535	360
0.1209	0.0959	450	0.1209	0.0959	555
0.1617	0.1367	566	0.1617	0.1367	702



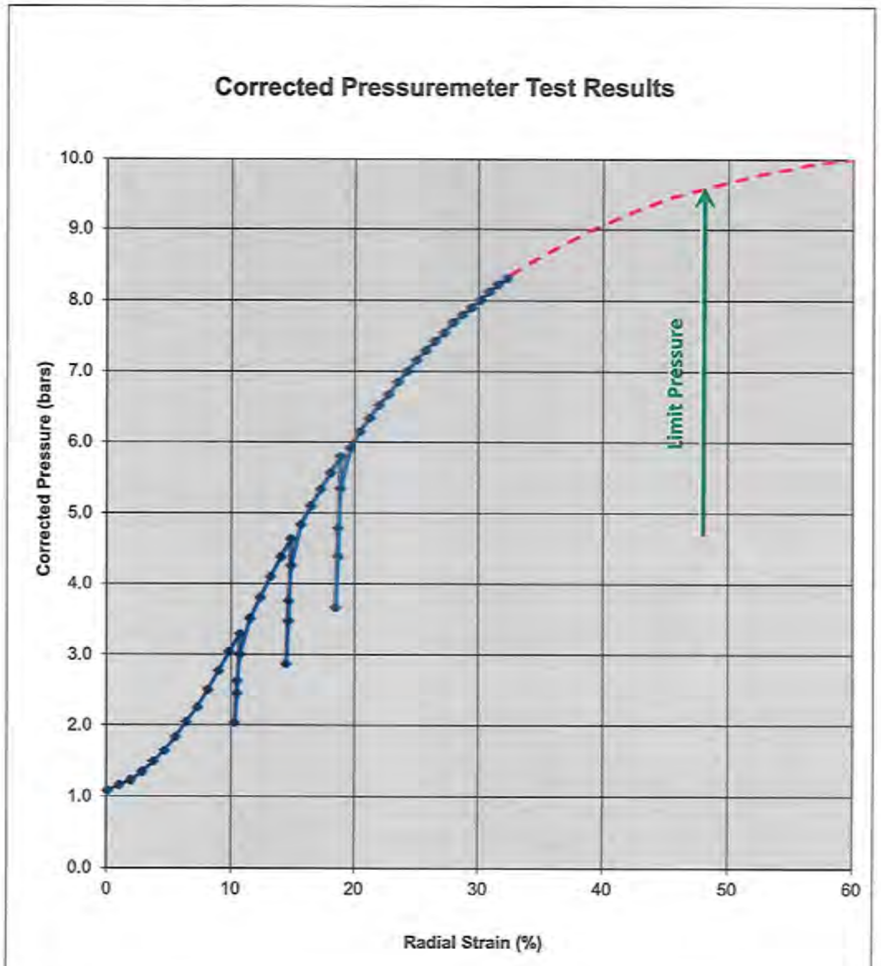
PRESSUREMETER TEST REPORT

PROJECT:	Wallops Island Northern Development	BORING:	P-2A
LOCATION:	Wallops Island, Virginia	TEST #:	3
IN-SITU SOIL TESTING, L.C.		DEPTH:	35.0 ft
ENGINEER:	Roger A. Failmezger, P.E., F. ASCE, D GE	TEST DATE:	December 30, 2020

Note: ***Depth*** refers to the distance from the ground surface to center of NX Probe.

Pressure Bar	Volume cm^3	$\Delta R/R_o$ %	Selected
1.08	0	0.00	
1.16	40	0.93	
1.23	80	1.85	
1.34	120	2.76	
1.49	160	3.66	
1.64	199	4.56	
1.84	239	5.45	
2.05	279	6.33	
2.26	319	7.20	E0a
2.50	359	8.06	
2.77	399	8.92	
3.04	438	9.77	E0b
3.30	478	10.62	E1a
2.45	469	10.42	
2.04	459	10.21	E1b
2.63	469	10.42	
3.01	479	10.62	E1c
3.52	518	11.46	
3.81	558	12.29	
4.10	598	13.11	
4.38	638	13.93	
4.64	677	14.75	E2a
3.48	668	14.56	
2.87	658	14.36	E2b
3.76	668	14.56	
4.26	678	14.75	E2c
4.84	717	15.56	
5.10	757	16.36	
5.33	797	17.16	
5.56	837	17.95	
5.80	877	18.74	E3a
4.39	867	18.55	
3.67	858	18.37	E3b
4.79	867	18.55	
5.35	877	18.74	E3c
5.92	917	19.52	
6.15	956	20.30	
6.34	996	21.07	
6.52	1036	21.84	
6.68	1076	22.60	
6.85	1116	23.36	
7.01	1156	24.11	
7.16	1196	24.86	
7.30	1236	25.61	
7.42	1276	26.35	
7.54	1315	27.08	
7.69	1355	27.82	
7.79	1395	28.54	
7.90	1435	29.27	
8.00	1475	29.99	
8.12	1515	30.70	
8.23	1555	31.42	
8.31	1595	32.12	

Interpreted Pressuremeter Parameters			
	P_o	1.5	bar
	Limit Pressure Strain	47.8%	
	P_L	9.6	bar
	P_L^*	8.1	bar
	E_o	44	bar
	E_o/P_L^*	5.5	bar
Loop #	Unload Modulus	Reload Modulus	
1	452	344	bar
2	694	537	bar
3	906	703	bar



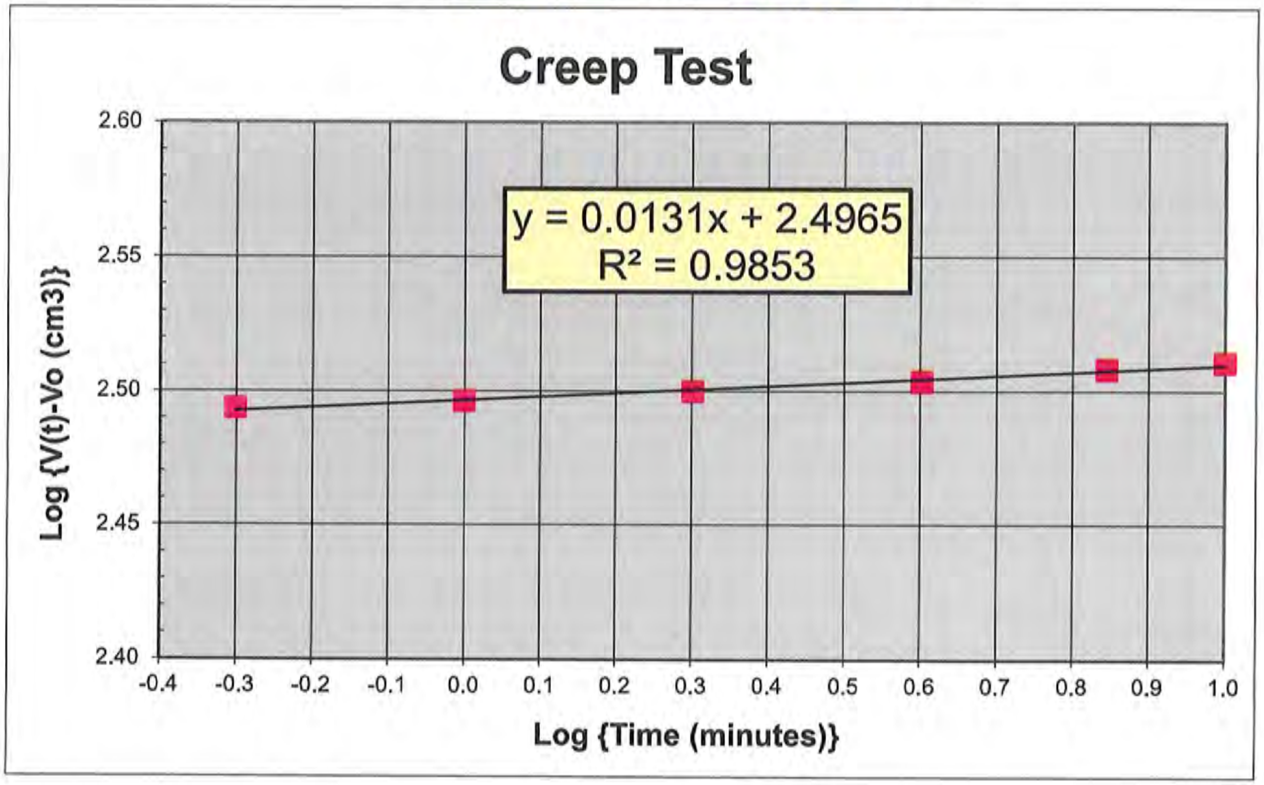
Pressuremeter Creep Test

Project: Wallops Island Northern Development
Sounding No.: P-2A
Test Depth: 35.0 feet
Holding Gauge Pressure = 2.78 bars
Corrected Pressure = 3.52 bars
Initial Probe Radius = 3.69 cm
Initial Probe Length = 50 cm
Initial Volume of Probe = 2139 cm^3
Probe Radius Contacting Borehole = 3.87 cm
Initial Borehole Volume, Vo = 2349 cm^3

Time (minutes)	Log (Time) (minutes)	Volume Increase (cm^3)	Total Probe Volume (cm^3)	$V(t)-V_0$ (cm^3)	Log $[V(t)-V_0]$ (cm^3)
0.5	-0.301	521.79	2660.60	311.54	2.494
1	0.000	523.73	2662.54	313.48	2.496
2	0.301	526.27	2665.08	316.02	2.500
4	0.602	529.04	2667.85	318.79	2.503
7	0.845	532.35	2671.16	322.10	2.508
10	1.000	534.21	2673.02	323.96	2.510

$E_0(t)/E_0(t=1\text{ min}) = \{t/1\}^{-n}$

n = 0.0131

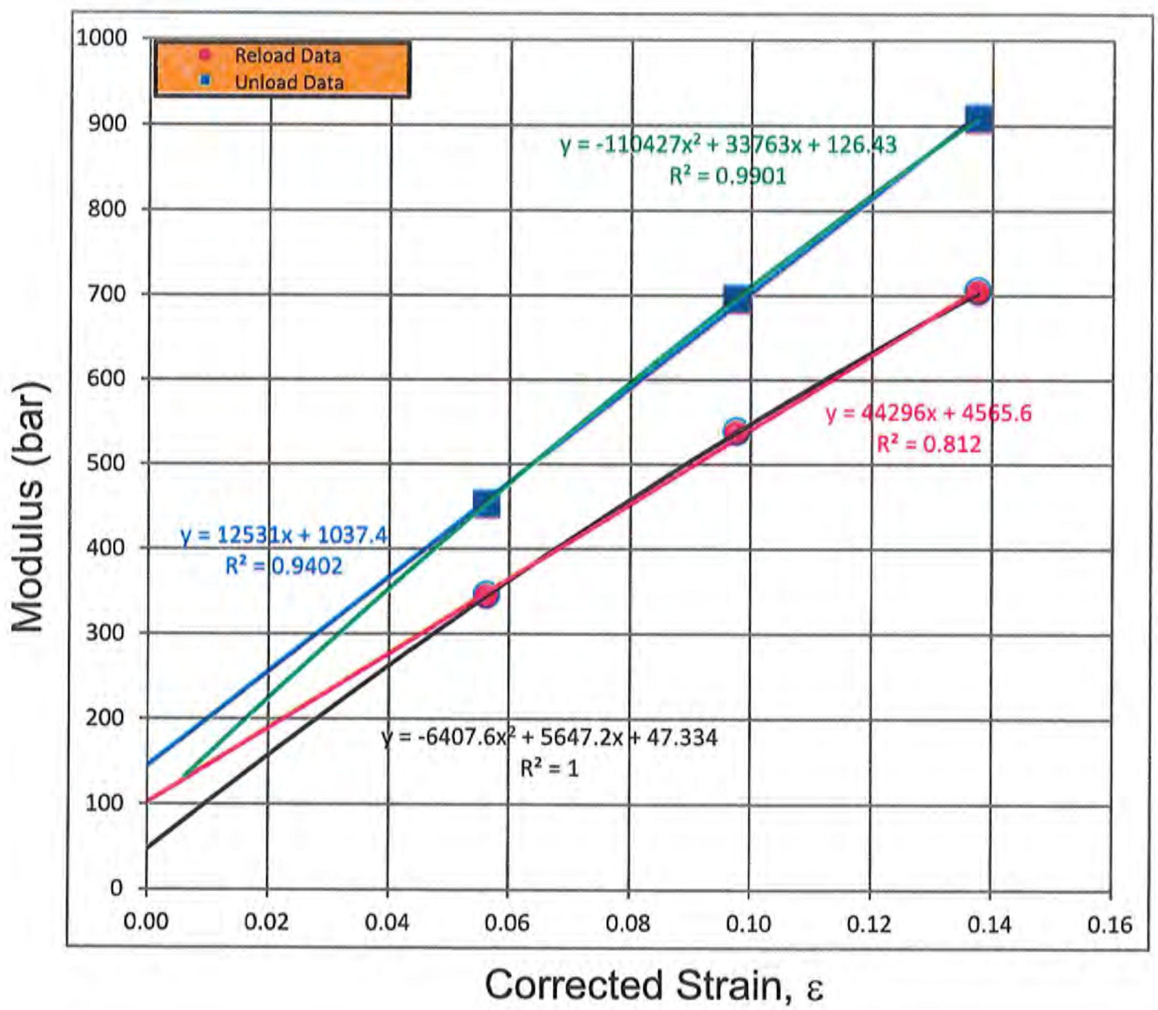


RELOAD/UNLOAD MODULUS ANALYSES

PROJECT: Wallops Island Northern Development		BORING:	P-2A
LOCATION: Wallops Island, Virginia		TEST #:	3
IN-SITU SOIL TESTING, L.C.		DEPTH:	35.0 ft
ENGINEER: Roger A. Failmezger, P.E., F. ASCE, D GE		TEST DATE:	12/30/2020

Strain to contact borehole = 0.048

Average Strain	Corrected Strain	Reload Modulus	Average Strain	Corrected Strain	Unload Modulus
0.1042	0.0562	344	0.1041	0.0561	452
0.1456	0.0976	537	0.1455	0.0975	694
0.1856	0.1376	703	0.1855	0.1375	906



PRESSUREMETER TEST REPORT

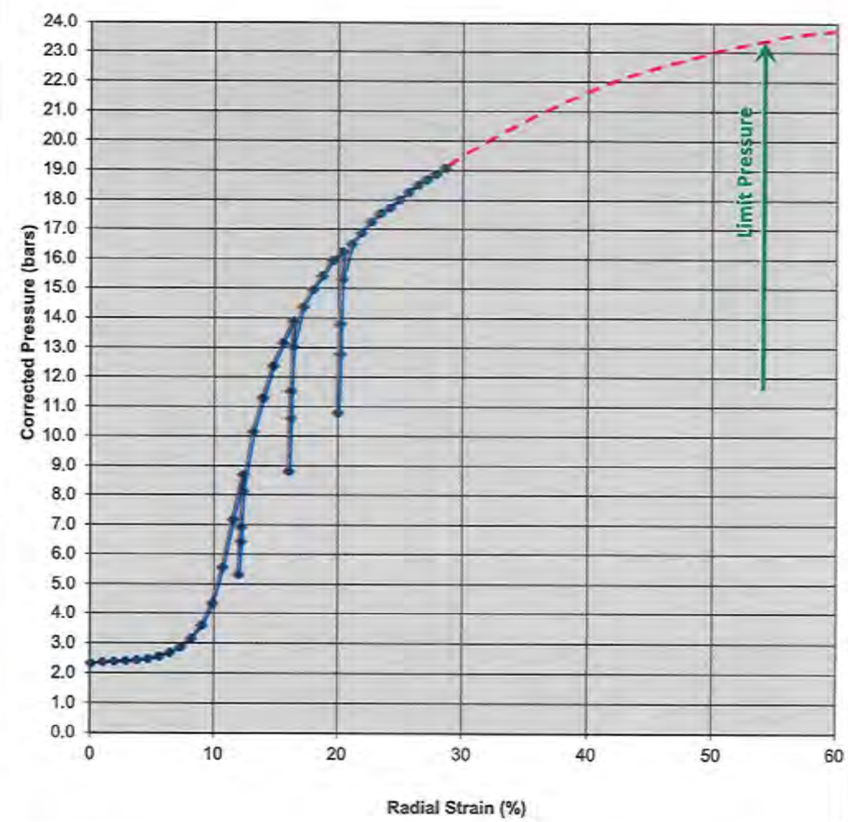
PROJECT: Wallops Island Northern Development		BORING:	P-2A
LOCATION: Wallops Island, Virginia		TEST #:	4
IN-SITU SOIL TESTING, L.C.		DEPTH:	76.0 ft
ENGINEER: Roger A. Failmezger, P.E., F. ASCE, D GE		TEST DATE:	December 30, 2020

Note: *Depth* refers to the distance from the ground surface to center of NX Probe.

Pressure Bar	Volume cm³	$\Delta R/R_o$ %	Selected
2.32	0	0.00	
2.36	40	0.93	
2.38	80	1.85	
2.40	120	2.76	
2.43	160	3.67	
2.48	200	4.56	
2.56	240	5.45	
2.68	280	6.33	
2.87	319	7.21	
3.14	359	8.07	
3.58	399	8.93	E0a
4.32	438	9.77	
5.57	478	10.60	
7.17	517	11.42	E0b
8.69	556	12.24	E1a
6.43	547	12.05	
5.32	538	11.86	E1b
6.93	547	12.05	
8.13	556	12.25	E1c
10.14	595	13.05	
11.27	634	13.86	
12.36	673	14.66	
13.15	713	15.46	
13.89	752	16.26	E2a
10.61	744	16.09	
8.81	735	15.92	E2b
11.52	744	16.09	
13.01	753	16.27	E2c
14.36	792	17.06	
14.95	831	17.84	
15.42	871	18.63	
15.94	911	19.41	
16.23	951	20.18	E3a
12.77	942	20.02	
10.79	934	19.86	E3b
13.80	942	20.02	
15.31	951	20.20	E3c
16.50	990	20.96	
16.87	1030	21.72	
17.24	1070	22.48	
17.53	1110	23.24	
17.72	1150	23.99	
18.01	1189	24.74	
18.26	1229	25.49	
18.50	1269	26.23	
18.69	1309	26.96	
18.87	1349	27.70	
19.07	1389	28.42	

Loop #	Interpreted Pressuremeter Parameters		
	P_o	2.8	bar
	Limit Pressure Strain	53.4%	
	P_L	23.3	bar
	P_L^*	20.5	bar
	E_o	211	bar
	E_o/P_L^*	10.3	bar
Loop #	Unload Modulus	Reload Modulus	
1	1336	1092	bar
2	2284	1827	bar
3	2645	2122	bar

Corrected Pressuremeter Test Results



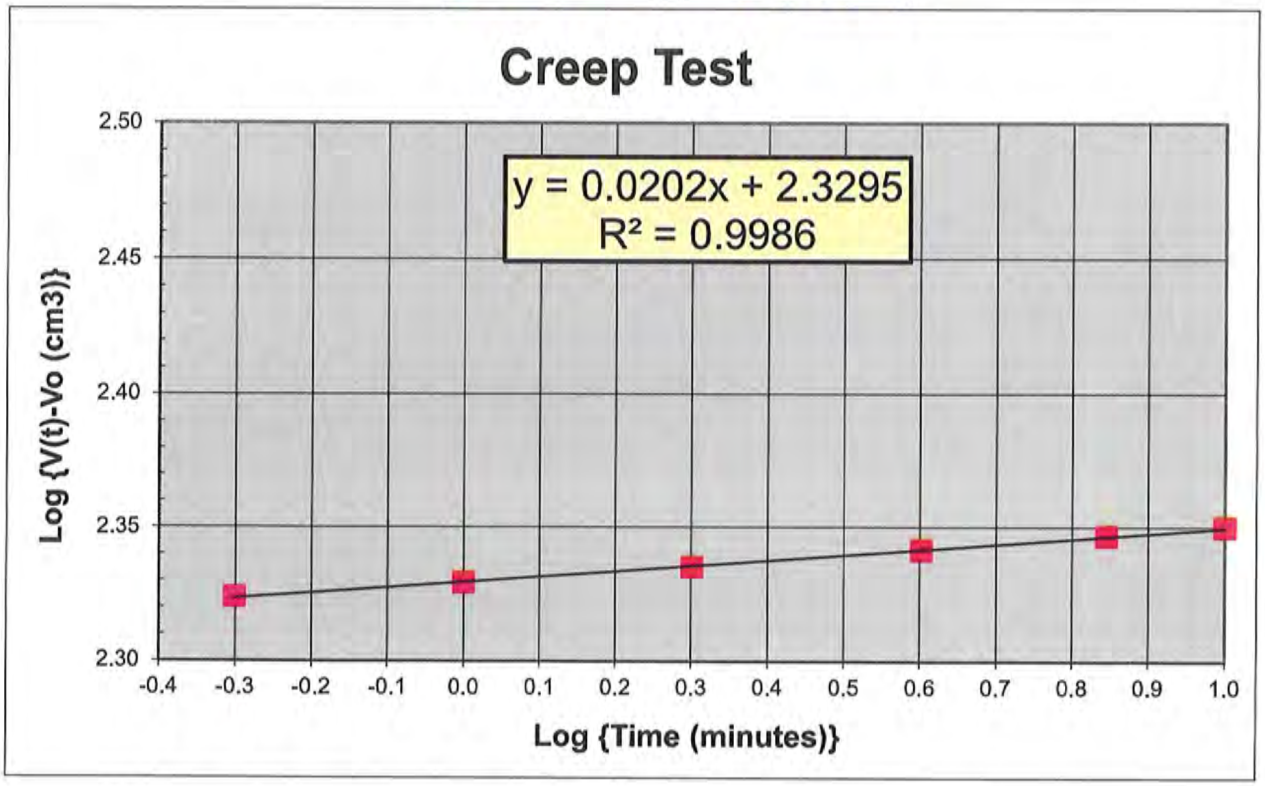
Pressuremeter Creep Test

Project: Wallops Island Northern Development
Sounding No.: P-2A
Test Depth: 76.0 feet
Holding Gauge Pressure = 8.19 bars
Corrected Pressure = 10.14 bars
Initial Probe Radius = 3.69 cm
Initial Probe Length = 50 cm
Initial Volume of Probe = 2139 cm^3
Probe Radius Contacting Borehole = 4.01 cm
Initial Borehole Volume, Vo = 2532 cm^3

Time (minutes)	Log (Time) (minutes)	Volume Increase (cm^3)	Total Probe Volume (cm^3)	$V(t)-V_0$ (cm^3)	Log $[V(t)-V_0]$ (cm^3)
0.5	-0.301	603.80	2742.61	210.81	2.324
1	0.000	606.46	2745.27	213.47	2.329
2	0.301	609.26	2748.07	216.27	2.335
4	0.602	612.51	2751.32	219.52	2.341
7	0.845	615.15	2753.96	222.16	2.347
10	1.000	616.85	2755.66	223.86	2.350

$E_0(t)/E_0(t=1\text{ min}) = \{t/1\}^{-n}$

n = 0.0202

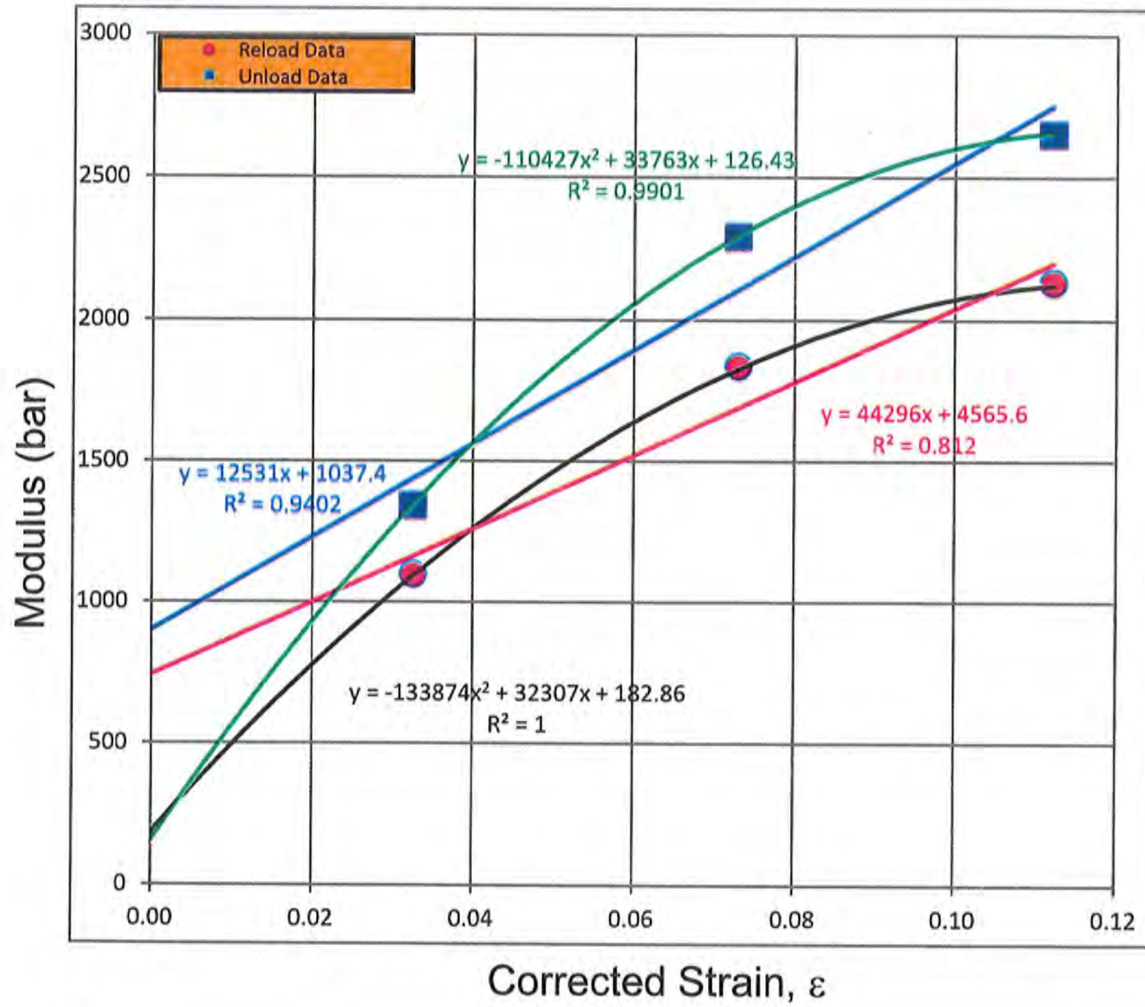


RELOAD/UNLOAD MODULUS ANALYSES

PROJECT:	Wallops Island Northern Development	BORING:	P-2A
LOCATION:	Wallops Island, Virginia	TEST #:	4
IN-SITU SOIL TESTING, L.C.		DEPTH:	76.0 ft
ENGINEER:	Roger A. Failmezger, P.E., F. ASCE, D GE	TEST DATE:	12/30/2020

Strain to contact borehole = 0.088

Average Strain	Corrected Strain	Reload Modulus	Average Strain	Corrected Strain	Unload Modulus
0.1205	0.0325	1092	0.1205	0.0325	1336
0.1609	0.0729	1827	0.1609	0.0729	2284
0.2003	0.1123	2122	0.2002	0.1122	2645



JOHN D. HYNES & ASSOCIATES, INC.

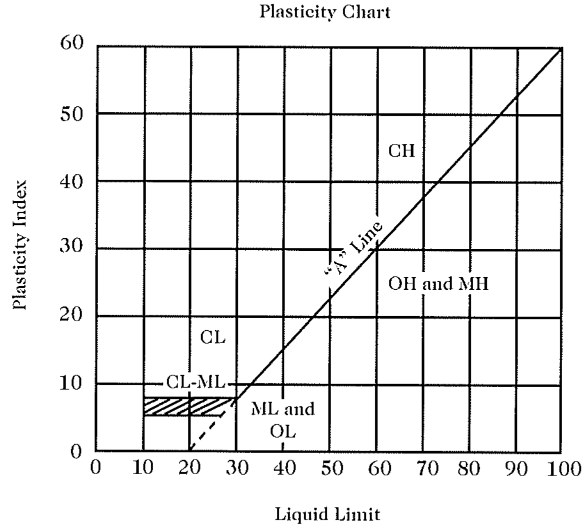
Geotechnical and Environmental Consultants
Monitoring Well Installation
Construction Inspection and Materials Testing

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions			*Group Symbols*	*Typical Names*	*Laboratory Classification Criteria*	
Coarse-grained soils (More than half of material is larger than No 200 sieve size)	Gravels (More than half of coarse fraction is larger than No 4 sieve size)	Clean gravels (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			GP	Poorly graded gravels, gravel sand mixtures, little or no fines	Not meeting all graduation requirements for GW	
		Gravels with fines (Appreciable amount of fines)	GM[a] d / u	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are *border-line* cases requiring use of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures	Atterberg limits above "A" line with P.I. greater than 7	
	Sands (More than half of coarse fraction is smaller than No 4 sieve size)	Clean sands (Little or no fines)	SW	Well-graded sands, gravelly sands,	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			SP	Poorly graded sands, gravelly sands, little or no fines	Not meeting all graduation requirements for SW	
		Sands with fines (Appreciable amount of fines)	SM[a] d / u	Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are *border-line* cases requiring use of dual symbols.
			SC	Clayey sands, sand-clay mixtures	Atterberg limits above "A" line with P.I. greater than 7	
Fine-grained soils (More than half material is smaller than No 200 sieve)	Silts and clays (Liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity		
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
			OL	Organic silts and organic silty clays of low plasticity		
	Silts and clays (Liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts		
			CH	Inorganic clays of high plasticity, fat clays		
			OH	Organic clays of medium to high plasticity, organic silts		
	Highly organic soils		Pt	Peat and other highly organic soils		

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No 200 sieve size), coarse grained soils are classified as follows:
Less than 5 percent — GW, GP, SW, SP
More than 12 percent — GM, GC, SM, SC
5 to 12 percent — *Borderline cases requiring dual symbols*[b]

Plasticity Chart



32185 Beaver Run Drive • Salisbury, Maryland 21804 • 410-546-6462 • Fax 410-548-5346
E-mail - jdhynes@aol.com

HYNES

FIELD CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

NON-COHESIVE SOILS
(Silt, Sand, Gravel and Combinations)

DENSITY

Very Loose	- 5 blows/ft. or less
Loose	- 6 to 10 blows/ft.
Medium Dense	- 11 to 30 blows/ft.
Dense	- 31 to 50 blows/ft.
Very Dense	- 51 blows/ft. or more

RELATIVE PROPORTIONS

Descriptive Term	Percent
Trace	1 - 10
Little	11 - 20
Some	21 - 35
And	36 - 50

PARTICLE SIZE IDENTIFICATION

Boulders	- 8 inch diameter or more
Cobbles	- 3 to 8 inch diameter
Gravel	- Coarse - 1 to 3 inch
	- Medium - 1/2 to 1 inch
	- Fine - 4.75 mm to 1/2 inch
Sand	- Coarse - 2.0 mm to 4.75 mm
	- Medium - 0.425 mm to 2.0 mm
	- Fine - 0.075 mm to 0.425 mm
Silt	- 0.075 mm to 0.002 mm

COHESIVE SOILS
(Clay, Silt and Combinations)

CONSISTENCY

Very Soft	- 3 blows/ft. or less
Soft	- 4 to 5 blows/ft.
Medium Stiff	- 6 to 10 blows/ft.
Stiff	- 11 to 15 blows/ft.
Very Stiff	- 16 to 30 blows/ft.
Hard	- 31 blows/ft. or more

PLASTICITY

Degree of Plasticity	Plasticity Index
None to Slight	0 - 4
Slight	5 - 7
Medium	8 - 22
High to Very High	over 22

Classification on logs are made by visual inspection of samples unless a sample has been subjected to laboratory classification testing.

Standard Penetration Test - Driving a 2.0" O.D., 1-3/8" I.D., splitspoon sampler a distance of 1.0 foot into undisturbed soil with a 140 pound hammer free falling a distance of 30.0 inches. It is customary to drive the spoon 6 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and making the test are recorded for each 6 inches of penetration on the drill log (Example - 6/8/9). The standard penetration test value (N - value) can be obtained by adding the last two figures (i.e. 8 + 9 = 17 blows/ft.). (ASTM D-1586)

Strata Changes - In the column "Soil Descriptions," on the drill log, the horizontal lines represent strata changes. A solid line (—) represents an actually observed change, a dashed line (----) represents an estimated change.

Groundwater - Observations were made at the times indicated. Porosity of soil strata, weather conditions, site topography, etc. may cause changes in the water levels indicated on the logs.

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Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GBC GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org

JOHN D. HYNES & ASSOCIATES, INC.

Geotechnical and Environmental Consultants
Monitoring Well Installation
Construction Inspection and Materials Testing

March 31, 2021

Roland E. Holland, P.E.
George, Miles & Buhr, LLC
206 West Main Street
Salisbury, Maryland 21801

Re: Report of Subsurface Exploration and Geotechnical Consulting Services
Wallops Island UAS Runway and Port Integration Project
Wallops Island, Virginia
Project No.: JDH-10/20/271

Dear Mr. Holland:

John D. Hynes & Associates, Inc. has completed the authorized subsurface exploration and geotechnical engineering evaluations for proposed Wallops Island UAS Runway and Port Integration project located in Wallops Island, Virginia. Our services were performed, generally, in accordance with our proposals dated December 18, 2020.

This report describes the exploration methods employed, exhibits the data obtained and presents our evaluations and recommendations. This report presents the findings of our exploration and provides recommendations for the design and construction of the proposed foundations for new pre-engineering buildings; lateral earth pressures for culvert; and pavements for the access road of runway and pavement for a new parking lot.

We appreciate the opportunity to be of service to you. If you have any questions regarding the contents of this report or if we may be of further assistance, please contact our office.

Respectfully,
JOHN D. HYNES & ASSOCIATES, INC.

For: Alycen E. Kus
Environmental Staff

Richard D. Rhoads
Project Geologist

Duowen Ding
Project Engineer

FOR

John D. Hynes, P.E
President

AEK: RDR: DD: JDH/jsl

HYNES

REPORT OF
SUBSURFACE EXPLORATION
AND
GEOTECHNICAL CONSULTING SERVICES

WALLOPS ISLAND UAS RUNWAY
AND
PORT INTEGRATION PROJECT
WALLOPS ISLAND, VIRGINIA

PREPARED FOR
GEORGE, MILES & BUHR, LLC

MARCH 31, 2021
PROJECT NO.: JDH-10/20/271

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PURPOSE AND SCOPE

The subsurface exploration study was performed to evaluate the subsurface conditions with respect to the following:

1. General site and subgrade preparation;
2. Fill and backfill construction;
3. Foundation recommendations, including allowable bearing capacity, estimated settlement, and embedment depths of spread footings;
4. Foundation construction and inspection procedures;
5. Floor slab support;
6. Seismic site classification;
7. Lateral earth pressure requirements for culvert below grade walls;
8. Pavement subgrade preparation and cross-section design;
9. Location of groundwater and applicable construction dewatering control procedures; and
10. Other aspects of the design and construction for the proposed structures indicated by the exploration.

An evaluation of the site, with respect to potential construction problems and recommendations dealing with earthwork and inspection during construction, is included. The inspection is considered necessary both to confirm the subsurface conditions and to verify that the soils related construction phases are performed properly.

EXISTING SITE CONDITIONS

As shown on the Project Location Map (Drawing JDH-10/20/271-A) in the Appendix, the project site is part of the Wallops Island Flight facility located in Wallops Island, Virginia. At the time of our field work, the site was developed with the Wallops Island UAS Runway and associated access roadway and culvert. The project area is located northeast of the North Seawall Road, at the north end of Wallops Island.

PROJECT CHARACTERISTICS

We understand that the project includes improvements to the existing runway and access path at the north end of Wallops Island to compliment the new port project at the northeast end of the runway area. A parking area is, also, proposed south of the existing runway. The project, also, includes the replacement of a culvert located on the access roadway to the runway. A hanger building is, also, proposed.

The site improvements include construction of a parking lot, and improvements to and extension of the runway access path. George, Miles & Buhr, LLC provided CBR test data for a previous study that was completed at the project site. In addition, replacement of an existing culvert will be required to span an approximately channel along the existing access path to the south of the runway.

Potential future improvements include construction of an addition to the existing hangar structure on the facility. GMB indicated column loads would be 50 kips for the structure.

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FIELD EXPLORATION AND STUDY

In order to determine the nature of the subsurface conditions at the site, a total of 13 test borings were drilled at the site on February 22 and 23, 2021 at the approximate locations shown on the Boring Location Plans (Drawing No. JDH-10/20/271-B1, B2 and B3) in the Appendix. The borings were designated as B-3 through B-15. We note that borings B-1 and B-2 were previously drilled during completion of a separate project.

The current exploration included 7 borings, designated as B-3 through B-9, at the proposed location of an access roadway on the north side of the existing runway. The borings were drilled to depths of 5 feet below the ground surface. Boring B-10 was drilled at the location of a proposed parking area to support runway operations. The boring was drilled to a depth of 20 feet below the ground surface. Borings B-11 and B-12 were drilled in the area of the proposed culvert relocation. The borings were drilled to depths of 40 feet below the ground surface. Borings B-13, B-14 and B-15 were drilled at the location of a future hangar building on the project site. Borings B-13 and B-15 were drilled to depths of 20 feet below the ground surface and boring B-14 was drilled to a depth of 50.5 feet. Borings B-10 through B-15 were drilled using a Mobile B-47 HD drill rig. Borings B-3 through B-9 were drilled using a hand auger.

Soil sampling and testing were carried out in accordance with ASTM Specification D-1586. A brief description of our field procedures is included in the Appendix. The results of all boring and sampling operations are shown on the boring logs.

Samples of the subsurface soils were examined by our engineering staff and were visually classified in accordance with the Unified Soil Classification System (USCS). The USCS system nomenclature (CL, SM, etc.) is noted on the log sheets. Also included are reference sheets, which define the USCS terms and symbols used on the boring logs.

We note that the test boring records represent our interpretation of the field data based on visual examination and selected soil classification tests. Indicated interfaces between materials may be gradual.

The field exploration data was supplemented with laboratory testing data. The laboratory at John D. Hynes & Associates, Inc. performed 3 Atterberg Limits (Liquid and Plastic) tests, one Sieve Analysis test, and 4 Natural Moisture Content tests. The test results are presented on the boring logs in the Appendix. Results from 12 CBR tests from a previous site evaluation were provided to Hynes & Associates.

SUBSURFACE CONDITIONS

At the time of our field exploration, approximately 2 to 4 inches of organic bearing soil was encountered at the ground surface at the boring locations B-3 through B-10. We encountered 2 to 4 inches of gravel at the ground surface at boring locations B-11 through B-15. Varying thickness of organic bearing soil, or other surficial materials and material thicknesses may be encountered at other locations on site.

The subsurface soils were visually classified in accordance with the USCS as interbedded layers of SAND (SP, SP-SM), Silty SAND (SM), SAND and SILT (SM-ML), Clayey SILT (ML), and Silty CLAY (CL, CH) to the boring termination depths. In the borings, sands were characterized by Standard Penetration Test (SPT) values (N-values) ranging from 5 to 32 blows per foot. This range of penetration resistance indicates in-place relative densities of very loose to dense. In the cohesive soils, N-values ranging from WOH/18 inches to 20 blows per foot were encountered, indicating in-place consistencies of very soft to very stiff.

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Groundwater was encountered during drilling operations at depths ranging from 1 to 4.5 feet below existing grade. Groundwater elevations may vary at other times during the year depending upon the amount of local precipitation and the water level in the adjacent bay, channels, and the Atlantic Ocean.

RECOMMENDATIONS

The following recommendations and considerations are based on our understanding of the proposed construction, the data obtained from the exploration, and our previous experience with similar subsurface conditions and projects. If there are any significant changes to the project characteristics, such as revised structural loadings, building geometry, building locations, elevations, etc., we request that this office be advised so the recommendations of this report can be re-evaluated. Additional recommendation will be provided for the channel crossing structure, upon request.

A. Site Preparation

Prior to the construction of foundations, ground slabs, pavements, or the placement of fill in any structural areas, all existing organic materials, frozen or wet, excessively soft or loose soils, root mats, debris, and other deleterious materials should be removed and wasted. The existing organic bearing soil should be stripped from the structural areas and can be stockpiled for reuse in landscape areas. If perched surface water is encountered during any grading or excavation process, Hynes & Associates should be consulted for additional recommendations regarding the stabilization of the bases of the excavations and backfilling.

If temporary trenches or excavations deeper than 4 feet are required for utilities or foundation elements, these should be sloped back at least to 1.5H:1V slope to prevent failure that can be experienced at vertical excavations. The contractor may, also, implement the requirements stipulated by OSHA for support of excavations. Refer to OSHA 29 CFR Part 1926 for the requirements.

After the stripping operations have been completed, the exposed subgrade soils should be inspected. The inspector should verify that organic matter, and debris have been removed from structural subgrade areas. The inspector should require the exposed subgrade materials be proofrolled utilizing a heavily loaded dump truck or other pneumatic tired vehicle of similar size and weight. The purpose of proofrolling would be to provide surficial densification and to locate any isolated areas of soft or loose soils requiring undercutting. Proofrolling is not advised in wet areas which may deteriorate under repeated vehicular loading. Wet areas should be drained and allowed to dry prior to proofrolling. Precipitation may result in standing water (perched water) at low areas. If the water is allowed to pond, the natural soils may deteriorate and overexcavation or subgrade improvements may be necessary at those areas. The Geotechnical Engineer should be consulted to evaluate poor subgrade conditions during construction.

Care should be exercised during the grading operations at the site. Shallow SP, SP-SM, and SM materials were identified at the boring locations. These materials are slightly (SP, SP-SM) to moderately (SM) sensitive to changes in moisture conditions and should therefore be protected. Most native shallow soils are SP-SM and SM materials. If earthwork is performed in the presence of moisture, the traffic of heavy equipment, including heavy compaction equipment, may create pumping and a general deterioration of the subgrade soils. Construction traffic should be minimized at structural subgrade areas. If subgrade problems arise, the Geotechnical Engineer should be consulted for an evaluation of the conditions. Overexcavated areas resulting from the removal of organic matter, debris, abandoned utility lines, or otherwise unacceptable materials should be backfilled with properly compacted materials in accordance with the procedures discussed in the following section.

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B. Fill Selection, Placement and Compaction

It is recommended that all materials to be used as structural fill be inspected, tested and approved by the Geotechnical Engineer prior to use. The native SM, SP-SM, and SP soils can be reused for structural fill. Acceptable borrow material should include GW, SM, SW, SP and SM classified in accordance with the USCS. Furthermore, the material to be utilized as structural fill should have a Plasticity Index (PI) less than 20.

The importation of high quality, granular material should be allowed, and acceptable unit rates for importation and placement should be established. Sand, gravel or sand/gravel mixtures would be appropriate for wet weather placement. Otherwise, the materials noted above will be acceptable for use as structural fill. Native or imported SM soils will be sensitive to alteration in moisture content and will become unworkable during and following periods of precipitation. For this reason, if earthwork is attempted in late autumn, winter or early spring, the above mentioned high quality imported granular material should be limited to those soils better than SM. SM materials become unworkable at moisture contents greater than 3 percentage points above optimum. The contractor would have to dry these SM materials or set them aside for use in landscaping areas.

Structural fill should be placed in lifts which are 8 inches or less in loose thickness and should be compacted to at least 95 percent of the Modified Proctor maximum dry density (ASTM D-1557). Adjustments to the natural moisture content of the soils may be required in order to obtain specified compaction levels. Should utility construction be performed after earthwork, the Contractor should be responsible for achieving 95 percent compaction in all trench backfill. These guidelines should be set for all structural fill at the site including, but not limited to building, ground slab and pavement fills.

For the proofrolling and fill compaction operations, fill limits should be extended at least 5 feet beyond the building exterior walls, exterior columns, and pavement boundaries. A sufficient number of in-place density tests should be performed by an engineering technician to verify that the proper degree of compaction is being obtained in all fill soils.

C. Pre-Engineering Building Foundations

The proposed project includes the construction of a pre-engineered metal building. The new building will be situated on the south side of the runway at the area of test borings B-13, B-14 and B-15. The pre-engineered building will be a one-story building with a rigid frame, and have a concrete slab on grade. George, Miles & Buhr indicated that maximum column loads will not exceed 50 kips.

Based on the subsurface conditions found in test borings B-13, B-14 and B-15, we recommend that the building be supported by spread footing foundations. The spread footings may be proportioned based upon a maximum allowable soil bearing pressure not in excess of 2,500 psf. If our recommendations are followed, we estimate total settlements of 1 inch or less. Footings may bear on firm natural soils or controlled structural fill.

Some locations may be encountered where less than the required bearing is available. At those locations, compaction in the footing excavations may be necessary or minor overexcavation may yield greater soil support. For this reason, the inspection of the footing excavations by the Geotechnical Engineer is advised.

Minimum dimensions of 30 inches for square footings and 24 inches for continuous or rectangular footings should be used in foundation design to minimize the possibility of a local shear failure. All foundation excavations should be inspected by the Geotechnical Engineer or his approved representative prior to the

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placement of concrete. The purpose of the inspection would be to verify that the exposed bearing materials are acceptable for the design soil bearing pressure and that loose, wet, frozen or compressible soils are not present.

Spread footings should be located at a depth of at least 24 inches to bottom of footing below the outside final grade to provide adequate frost cover protection. Soils exposed at the bases of all satisfactory foundation excavations should be protected against any detrimental change in condition, such as disturbance from rain or frost. Surface runoff should be drained away from the excavations and not be allowed to pond.

D. Floor Slab Support

Ground supported slabs for the building may be supported on firm, natural soils or on a layer of controlled, structural fill. The subgrade should be prepared in accordance with the procedures described in Sections A and B of this report. It is, also, recommended that a 4 to 6 inch clean, granular, leveling and load-distributing material such as washed gravel, or screened crushed stone, be used beneath the building floor slabs. These materials will require acquisition from off-site sources. Prior to placing the leveling and load distributing material, the building slab subgrade should be free of standing water or mud. An acceptable moisture barrier should also be provided for the store building slab. These procedures will help to prevent capillary rise and damp floor slab conditions. For native soil or fill material placed and compacted according to the procedures outlined in this report, we recommend using a value of modulus of subgrade reaction of 200 pounds per cubic inch.

E. Seismic Site Classification

Hynes & Associates is providing below, the seismic site classification in accordance with the International Building Code (IBC) 2015. The code stipulates that we evaluate the strength of soil to a depth of 100 feet below grade. We used the soil properties indicated in the test boring which was drilled to a depth of 50.5 feet, and our experience locally. In consideration of the test boring data, it is our opinion that the average properties of the soils in the upper 100 feet of the local subsurface stratigraphy meet Site Classification "E" criteria.

We recommend using the following spectral design coefficients for seismic design for the Wallops Island site:

Seismic Design Coefficients for Wallops Island, Virginia	
$F_a=$	2.5
$F_v=$	3.5
$S_S=$	0.081
$S_1=$	0.042
$S_{DS}=$	0.135
$S_{D1}=$	0.099

These values were obtained and calculated in accordance with the IBC 2015 and ASCE 7. These are site specific design values and are based on a Site Classification of E.

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F. Lateral Earth Pressures for the Culvert Walls/Bridge Abutments

The proposed project includes the construction of a culvert over an existing creek. Test borings, designated as B-11 and B-12, were drilled on each side of the creek to depths of 50.5 feet below the ground surface. Below the surficial organic bearing soils, borings identified Silty SAND (SM), SAND and SILT (SM-ML) and Silty CLAY (CL, CH). In the borings, sands were characterized by Standard Penetration Test (SPT) values (N-values) ranging from 4 to 12 blows per foot. This range of penetration resistance indicates in-place relative densities of very loose to medium dense. In the cohesive soils, N-values ranging from WOH/18 inches to 16 blows per foot were encountered, indicating in-place consistencies of very soft to very stiff.

For the design of the below grade culvert walls/bridge abutments, we recommend using an equivalent fluid density of 60 pounds per cubic foot (pcf) for soils behind that the walls/abutments that are above the water table. Soil used as backfill behind the walls/abutments should be a clean, granular backfill having the following geotechnical engineering properties and lateral earth pressure coefficients:

Total Unit Weight (pcf)	Friction Angle	K_O	K_A	K_P
125	30°	0.5	0.33	3

The culvert foundation walls/bridge abutments should be designed to support surcharge loads from anticipated loads adjacent to the walls, and vehicular traffic. A lateral surcharge loading should, also, be applied in wall/abutment designs to account for all construction and future traffic loading to be applied adjacent to the walls/abutments. Please see sketch (Drawing No. JDH-10/20/176-C) in the Appendix for loading parameters for the undrained condition.

Backfill immediately behind walls should be relatively clean, granular material containing less than 10 percent passing the No. 200 sieve (0.074 mm). In addition, the compaction behind these walls should be 92 to 95 percent of the Modified Proctor maximum dry density in accordance with ASTM D-1557. Since excessive compaction may cause yielding or damage to foundation and retaining walls, hand operated equipment should be used near the walls/abutments.

G. Truck Access Pavement

The project includes a new access road on the north side of the existing runway for passenger cars and LH-93 trucks. Test borings, designated as B-3 through B-9, were drilled in pavement areas to depths of 5 feet below the ground surface. Below the surficial organic bearing soils, borings identified SAND (SP and SP-SM), and Silty SAND (SM) in the upper 5.5 feet of the subgrade.

CBR test results were provided by GMB. The CBR test results ranged from 14.2 to 20.5. We used a design CBR of 14.3 (2/3 of the average CBR value).

Groundwater was encountered during drilling operations at depths ranging from 4 to 5 feet below existing grade at the boring locations of B-3 through B-9.

We understand that the traffic will be approximately 3 trucks (LH-93) per day, and light trucks and cars. For the noted traffic and the CBR values provided, we recommend the following pavement cross section:

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Surface Course (SM-1/SM-2, 9.5 MM)	1.5 inches
Base Course (IM-1, 19.00 mm)	3.5 inches
Subbase Stone (21A)	6 inches

If modifications to the pavement system are required or if actual traffic usage significantly differs from that described above, we request that this office be advised so that our recommendations can be re-evaluated.

The pavement materials and construction should be in accordance with the Virginia Department of Transportation (VDOT) standards, and this report. The aggregate subbase should be compacted to a minimum 95 percent of the Modified Proctor (ASTM D 1557, AASHTO T180) maximum dry density. All pavement subgrade areas should be inspected, proofrolled and tested by the Geotechnical Engineer.

The pavement subgrade and pavement layers should be graded such that surface water is carried off the pavement areas and away from the runway areas. The surface water should not be allowed to pond. Runoff onto adjacent properties should be controlled property.

H Parking Lot Pavement

The pavement materials and construction should be in accordance with the Virginia Department of Transportation, State Highway Administration, STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MATERIALS latest edition, and this report. The aggregate subbase should be compacted to a minimum 95 percent of the Modified Proctor (ASTM D 1557, AASHTO T180) maximum dry density prior to the placement of Hot Mix Asphalt (HMA). All pavement subgrade areas should be inspected, proofrolled and tested by the Geotechnical Engineer.

The pavement subgrade and pavement layers should be graded such that surface water is carried off of the pavement areas and away from runway areas. The surface water should not be allowed to pond. Runoff onto adjacent properties should be controlled property.

The project includes parking areas for passenger cars and light trucks. One test boring, designated as B-10 , was drilled in pavement areas to depths of 20 feet below the ground surface. Below the surficial organic bearing soils, the boring identified Silty SAND (SM) in the upper 5 feet of the subgrade. Groundwater was encountered during drilling operations at a depth of 1 foot below existing grade at the boring locations. We recommend raising the grade at least 1 foot at the pavement area.

Note that GMB provided 10 CBR test results. The average CBR was 21.4. We used a design CBR of 14.3.

Our recommendations our based on our assumed traffic loading of passenger cars, and light trucks. The following pavement section recommendations are provided assuming an improved compacted subgrade (top 12 inches compacted to 95 percent of the Modified Proctor maximum dry density); approved subgrade soil types and the indicated traffic usage:

PAVEMENT SECTION – RESTRICTED CAR AND LIGHT TRUCK TRAFFIC

Surface Course (SM-1/SM-2, 9.5 MM)	1.5 inches
Base Course (IM-1, 19.00 mm)	2.5 inches
Subbase Stone (21A)	4 inches

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If modifications to the pavement system are required or if actual traffic usage significantly differs from that described above, we request that this office be advised so that our recommendations can be re-evaluated.

The pavement materials and construction should be in accordance with the Virginia Department of Transportation (VDOT) standards, and this report. The aggregate subbase should be compacted to a minimum 95 percent of the Modified Proctor (ASTM D-1557, AASHTO T180) maximum dry density. All pavement subgrade areas should be inspected, proofrolled and tested by the Geotechnical Engineer.

The pavement subgrade and pavement layers should be graded such that surface water is carried off the pavement areas and away from the runway areas. The surface water should not be allowed to pond. Runoff onto adjacent properties should be controlled property.

I. Groundwater and Drainage

As noted under "SUBSURFACE CONDITIONS" above, groundwater was encountered during drilling operations at depths ranging from 2 to 11 feet below existing grade at the majority of the test boring locations. Groundwater was encountered at depths of 8.5 to 11 feet in the building area test borings. Relative to building foundations, the contractor will likely not experience construction problems relating to groundwater. The Contractors should be prepared to dewater the lowest excavations due to the infiltration of precipitation or perched water. These methods may include sumping and pumping, etc.

Efforts should be made to keep exposed subgrade areas dry during construction, primarily because the soils will be susceptible to deterioration and loss of strength in the presence of moisture. Adequate drainage should be provided at the site to minimize any increase in moisture content of the foundation and pavement subgrade soils. All pavements should be sloped away from the building to prevent ponding of water around it. The final site drainage should, also, be designed such that run-off onto adjacent properties is controlled properly.

ADDITIONAL SERVICES RECOMMENDED

Additional engineering, testing and consulting services recommended for this project are summarized below.

A. Site Preparation and Proofrolling Monitoring

The Geotechnical Engineer or experienced soils inspector should inspect the site after it has been stripped and excavated. The inspector should determine if any undercutting or in-place densification is necessary to prepare a subgrade for fill placement, or slab and pavement support. The inspector should look closely for buried rubble and debris, and explore where suspected, and remove where encountered.

B. Fill Placement and Compaction Monitoring

The Geotechnical Engineer or experienced soils inspector should witness all fill operations and take sufficient in-place density tests to verify that the specified degree of fill compaction is achieved. The inspector should observe and approve borrow materials used and should determine if their existing moisture contents are acceptable.

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C. Foundation Excavation Inspections

The Geotechnical Engineer should inspect all footing excavations for the structure. He should verify that the design bearing pressures are available and that no loose or soft areas exist beneath the bearing surfaces of the footing excavations.

D. Pavement System Inspection

Pavement subgrade soils should be inspected prior to the placement of pavement materials to verify that proper compaction has been achieved and that project specifications are being followed. A sufficient number of in place density tests should be performed to assure that the specified degree of compaction is achieved in the subbase stone layer and asphalt layers.

REMARKS

This report has been prepared solely and exclusively for George, Miles & Buhr, LLC. to provide guidance to design professionals in developing facilities plans for the Wallops Island UAS Runway and Port Integration project located in Wallops Island, Virginia. It has not been developed to meet the needs of others, and application of this report for other than its intended purpose could result in substantial difficulties. The Consulting Engineer cannot be held accountable for any problems which occur due to the application of this report to other than its intended purpose. This report in its entirety should be attached to the project specifications.

These analyses and recommendations are, of necessity, based on the concepts made available to us at the time of the writing of this report, and on-site conditions, surface and subsurface that existed at the time the exploratory borings were drilled. Further assumption has been made that the limited exploratory borings, in relation both to the areal extent of the site and to depth, are representative of conditions across the site. It is also recommended that we be given the opportunity to review all plans for the project in order to comment on the interaction of soil conditions as described herein and the design requirements.

Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with generally accepted engineering principles and practices.

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APPENDIX

1. Investigative Procedures
2. Project Location Map
3. Boring Location Plans
4. Boring Logs
5. Earth Pressure Requirements for Below Grade Walls (Undrained)
6. California Bearing Ratio (CBR) Test Data (completed by Others)
7. Unified Soil Classification Sheet
8. Field Classification Sheet
9. Information Sheet

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INVESTIGATIVE PROCEDURES

SOIL TEST BORINGS

Soil drilling and sampling operations were performed in accordance with ASTM Specification D-1586. The borings were advanced by mechanically turning continuous hollow stem auger flights into the ground. At regular intervals, samples were obtained with a standard 1.4 inch I.D., 2.0 inch O.D. splitspoon sampler. The sampler was first seated 6 inches to penetrate any loose cuttings and then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot is the "Standard Penetration Resistance". The penetration resistance, when properly evaluated, is an index to the soil's strength, density and behavior under applied loads. The soil descriptions and penetration resistances for each boring are presented on the Test Boring Records in the Appendix.

SOIL CLASSIFICATION

Soil classifications provide a general guide to the engineering properties of various soil types and enable the engineer to apply his past experience to current problems. In our investigation, jar samples obtained during drilling operations are examined in our laboratory and visually classified by the geotechnical engineer in accordance with ASTM Specification D-2488. The soils are classified according to the Unified Classification System (ASTM D-2487). Each of these classification systems and the in-place physical soil properties provides an index for estimating the soil's behavior.

ATTERBERG LIMITS TEST

Portions from representative soil samples obtained during drilling operations were selected for Atterberg Limits tests. The Atterberg Limits are indicative of the soil's plasticity characteristics. The liquid limit is the moisture content at which the soil will flow as a heavy viscous fluid and is determined in accordance with ASTM Specification D-4318. The plastic limit is the moisture content at which the soil begins to lose its plasticity and is determined in accordance with ASTM Specification D-4318.

SIEVE ANALYSIS

Gradational analysis tests were performed to determine the particle size and distribution of the samples tested. The grain size distribution of soils coarser than a No. 200 sieve is determined by passing the sample through a standard set of nested sieves. The percentage of materials passing the No. 200 sieve is determined by washing the material over a No. 200 sieve. These tests are in accordance with ASTM D-421, D-422 and D-1140. The results are presented in the Appendix to our report.

NATURAL MOISTURE TEST

Portions from representative soil samples obtained during drilling operations were selected for Natural Moisture Content testing. The Natural Moisture Content Test determines the moisture content of soils by drying the sample in an oven with a standard drying temperature of 110 °C. The loss of mass drying the sample, is used to determine the moisture content into the soil. The natural moisture content of the sample is calculated in percentage as the weight of water divided by the weight of dry soil times 100. The natural moisture content of soils is determined in accordance with ASTM Specification D-2216.

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INVESTIGATIVE PROCEDURES (CONTINUED)

CALIFORNIA BEARING RATIO

The results of the compaction testing described above were utilized in compacting samples for the laboratory California Bearing Ratio tests. The California Bearing Ratio, abbreviated as CBR, is a punching shear test. It provides data that are a semi-empirical index of the strength and deflection characteristics of a soil that has been correlated with pavement performance. This correlation has resulted in the establishment of design curves for pavement thickness.

The test is performed on a 6-inch diameter, 5-inch thick, disc of compacted soil which is confined in a steel cylinder. The specimens are first tested immediately after compaction and then soaked for four (4) days to simulate a saturated pavement subgrade.

A 1.95-inch diameter piston is forced into the soil at a standard rate and the resistance of the piston penetration is measured. The CBR is the ratio expressed as a percentage of the load at 1.0-inch piston penetration compared to the load required to produce the same penetration in a standard crushed stone.

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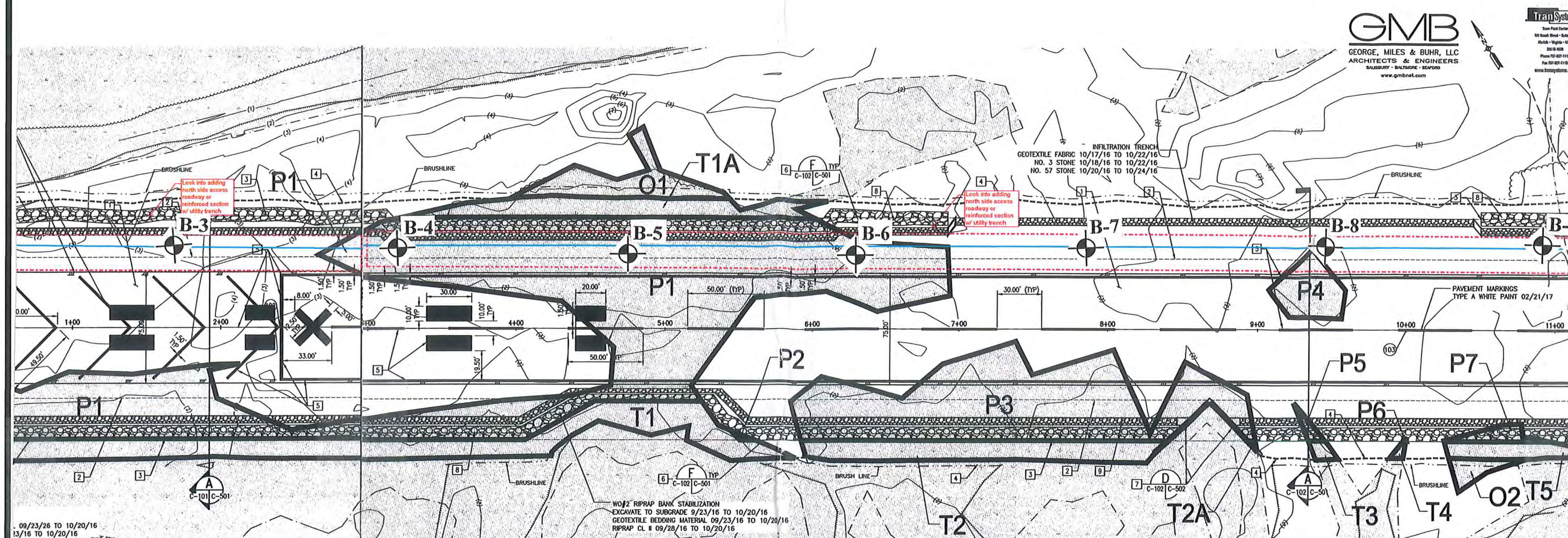
JOHN D. HYNES & ASSOCIATES, INC. 32185 Beaver Run Drive • Salisbury, Maryland 21804 410-546-6462 / Fax: 410-548-5346	**Date: February 22, 2021** **Scale: 1 in. = 2,000 ft.** **Drawn: ADC Map**
Project Location Map Wallops Island UAS Runway and Port Integration Project Wallops Island, Virginia	**DWG. No.** **JDH-10/20/271-A**



FINAL PLAN NOTES

1. LIMITS OF INFILTRATION TRENCH, RIPRAP BANK STABILIZATION, PAVEMENT AND RETAINING WALL ARE BASED ON REDLINE PLANS. FINAL LIMITS AND DIMENSIONS SHALL BE FIELD VERIFIED.
2. PAVEMENT MARKINGS ARE BASED ON REDLINE PLANS. FINAL LOCATION AND DIMENSIONS TO BE FIELD VERIFIED.
3. INFILTRATION TRENCH AND RIPRAP BANK STABILIZATION NOTES ARE PER REDLINE PLANS.

PLAN VIEW – AIRSTRIP

SCALE: 1" = 25'

SHEET NOTES:

1. REFER TO SHEET C-001 FOR LEGEND, GENERAL NOTES AND ABBREVIATIONS.
2. REFER TO SHEET C-002 FOR EXISTING SURVEY CONTROL, KEY PLAN, SURVEY NOTES AND STRUCTURE DATA.
3. REFER TO SHEET B-101 FOR SITE GEOTECHNICAL INFORMATION.
4. REFER TO SHEETS E-001 THROUGH E-601 FOR ELECTRICAL UTILITY CONSTRUCTION.
5. REFER TO SHEET C-101 FOR CONSTRUCTION LAYOUT COORDINATE TABLE.

KEY NOTES:

1 BITUMINOUS CONCRETE SURFACE COURSE. VDOT SM-9.5A – 3" THICK OVER 8" THICK AGGREGATE BASE COURSE – VDOT 21A
2 2-20' WIDE GRASS SHOULDER
3 150' WIDE RUNWAY SAFETY AREA/EDGE OF VEGETATIVE BUFFER
4 CLEARING LIMITS (WIDTH VARIES)
5 WHITE PAINT PAVEMENT MARKINGS
6 INFILTRATION TRENCH
7 SEGMENTAL CONCRETE BLOCK RETAINING WALL
8 RIPRAP BANK STABILIZATION. SEE DETAIL ON C-503.

WETLANDS PERMANENT DISTURBANCE		
NO.	CLASSIFICATION	ACREAGE
P1	PEM	39,678.48 SF
P2	PEM	32.37 SF
P3	PEM	12,773.76 SF
P4	PEM	1,512.78 SF
P5	PEM	147.82 SF
P6	PEM	2.30 SF
P7	PEM	410.41 SF

WETLANDS TEMPORARY DISTURBANCE		
NO.	CLASSIFICATION	ACREAGE
T1	PEM	12,284.34 SF
T1A	PEM	3,022.24 SF
T2	PEM	3,261.51 SF
T2A	PEM	23.62 SF
T3	PEM	176.05 SF
T4	PEM	58.83 SF
T5	PEM	1,296.12 SF

WETLANDS ORPHANED DISTURBANCE		
NO.	CLASSIFICATION	ACREAGE
O1	PEM	2,133.23 SF
O2	PEM	485.51 SF

COMMONWEALTH OF VIRGINIA
STEPHEN LEONARD MARSH
Lic. No. 032841
1-3-12
PROFESSIONAL ENGINEER

C-102

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GODDARD SPACE FLIGHT CENTER
WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA 23337

DATE	LET.	REVISIONS	CK.	AP.

PROJECT ENGINEER ____ DATE : ____
SUBMITTED BY ____ DATE : ____ PROJECT MANAGER
NASA SAFETY ____ DATE : ____
FIRE PROTECTION ____ DATE : ____
CONSTRUCTION MANAGEMENT ____ DATE : ____
O & M ____ DATE : ____
ENGINEERING APPROVAL ____ DATE : ____ ENGINEERING GROUP LEADER
BRANCH APPROVAL ____ DATE : ____ BRANCH HEAD

GRAPHIC SCALE 1"=25' 0' 25' 50'
AUTOCAD – RELEASE 2004
FILE NAME: 0117C-102.DWG
SCALE 1"=25'
SHEET 15 OF 39

UAS AIRSTRIP – FINAL PLANS
PLAN VIEW – AIRSTRIP

PROJECT NUMBER: P307100117
DR. RSP DATE: DEC 5, 2012
CK. MWB REVISED:
DRAWING NO 1613[illegible]

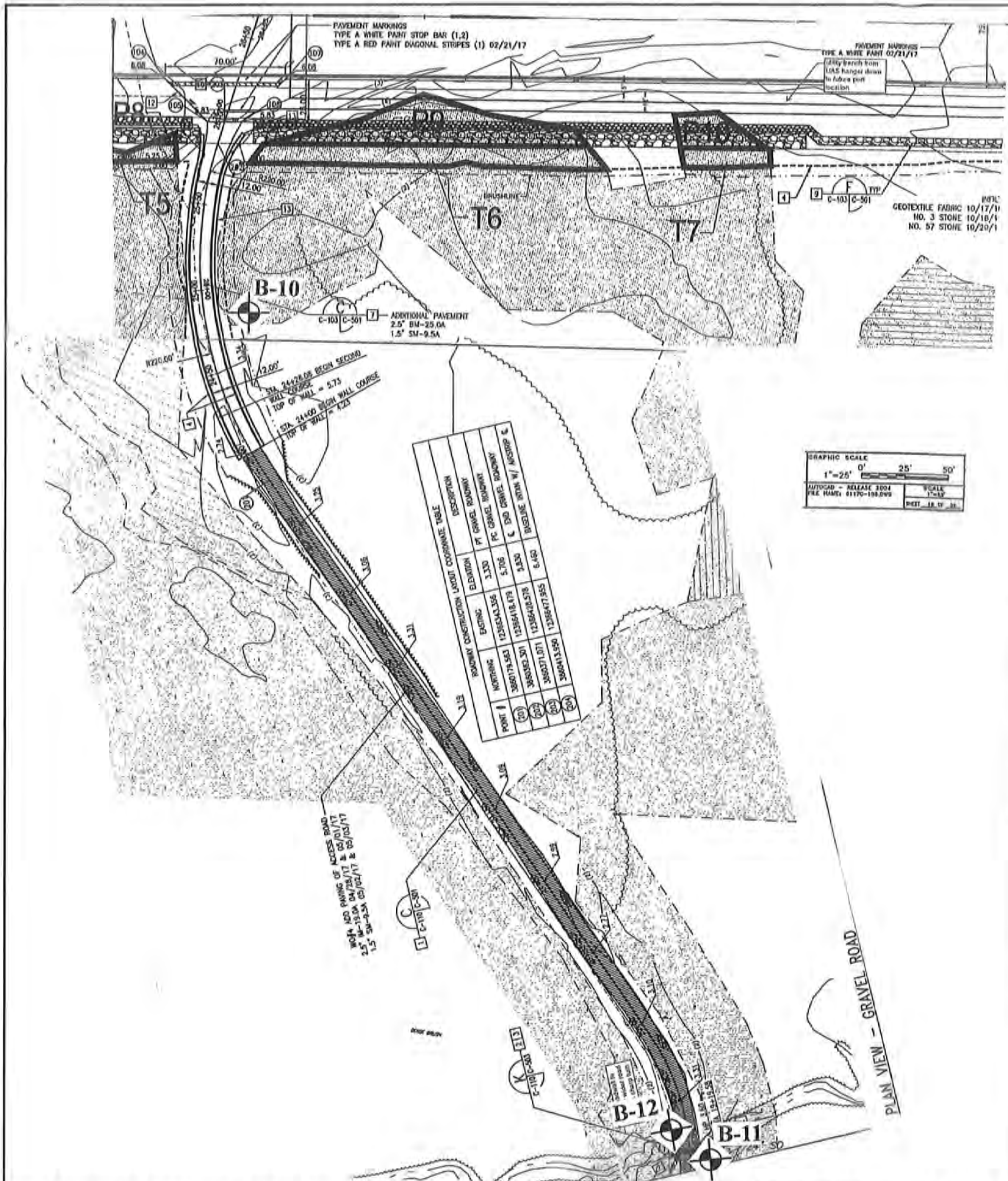
HYNES

JOHN D. HYNES & ASSOCIATES, INC.

32185 Beaver Run Drive • Salisbury, Maryland 21804
410-546-6462 / Fax: 410-548-5346

Boring Location Plan
Wallops Island UAS Runway and Port Integration Project
Wallops Island, Virginia

Date: February 22, 2021
Scale: As Shown
Drawn: GMB
DWG. No. JDH-10/20/271- B-1

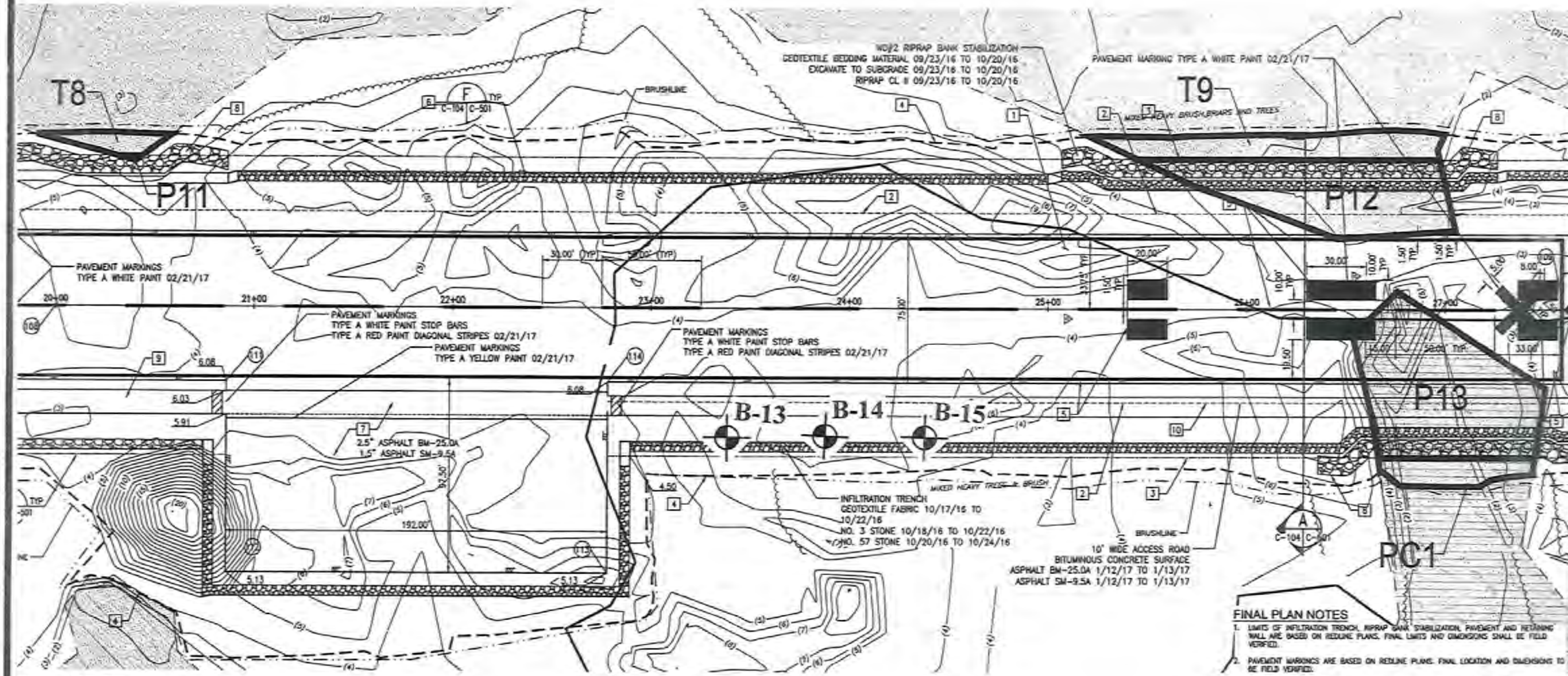


HYNES **JOHN D. HYNES & ASSOCIATES, INC.**

32185 Beaver Run Drive • Salisbury, Maryland 21804

410-546-6462 / Fax: 410-548-5346

	Date: February 22, 2021
	Scale: as shown.
	Drawn: GMB
Boring Location Plan Wallops Island UAS Runway and Port Integration Project Wallops Island, Virginia	**DWG. No.** **JDH-10/20/271-B-2**



W - AIRSTRIP

FINAL PLAN NOTES

1. LIMITS OF INFILTRATION TRENCH, RIPRAP BANK STABILIZATION, PAVEMENT AND RETAINING WALL ARE BASED ON REDLINE PLANS. FINAL LIMITS AND DIMENSIONS SHALL BE FIELD VERIFIED.
2. PAVEMENT MARKINGS ARE BASED ON REDLINE PLANS. FINAL LOCATION AND DIMENSIONS TO BE FIELD VERIFIED.
3. INFILTRATION TRENCH AND RIPRAP BANK STABILIZATION NOTES ARE PER REDLINE PLANS.

OTES:

- ET C-001 FOR LEGEND, GENERAL NOTES AND ABBREVIATIONS.
- ET C-002 FOR EXISTING SURVEY CONTROL, KEY PLAN, SURVEY NOTES AND STRUCTURE DATA.
- ET B-101 FOR SITE GEOTECHNICAL INFORMATION.
- ETS E-001 THROUGH E-601 FOR ELECTRICAL UTILITY CONSTRUCTION.
- ET C-101 FOR CONSTRUCTION LAYOUT COORDINATE TABLE.

KEY NOTES:

1. BITUMINOUS CONCRETE SURFACE COURSE, VDOT SM-9.5A – 3" THICK OVER 8" THICK AGGREGATE BASE COURSE – VDOT 21A
2. 20' WIDE GRASS SHOULDER
3. 150' WIDE RUNWAY SAFETY AREA/EDGE OF VEGETATIVE BUFFER
4. CLEARING LIMITS (WIDTH VARIES)
5. WHITE PAINT PAVEMENT MARKINGS
6. INFILTRATION TRENCH
7. 192' X 96' BITUMINOUS CONCRETE PAD. 8" THICK VDOT 21A AGGREGATE BASE COURSE. SEE SHEET C-503
8. RIPRAP BANK STABILIZATION. SEE SHEET C-503
9. 12' WIDE ACCESS ROAD. BITUMINOUS CONCRETE SURFACE. SEE DETAIL ON SHEET C-502
10. 10' WIDE ACCESS ROAD. BITUMINOUS CONCRETE SURFACE. SEE DETAILS ON SHEET C-502

WETLANDS PERMANENT DISTURBANCE		
NO.	CLASSIFICATION	ACREAGE
P11	PEM	12.84 SF
P12	PEM	4,179.39 SF
P13	PSS	5,566.92 SF

WETLANDS TEMPORARY DISTURBANCE		
NO.	CLASSIFICATION	ACREAGE
T8	PEM	472.29 SF
T9	PEM	2,096.42 SF

WETLANDS PERMANENT CONVERSION		
NO.	CLASSIFICATION	ACREAGE
PC1	PSS	945.47 SF

COMMONWEALTH OF VIRGINIA · STEPHEN LEONARD MARSH · Lic. No. 032841 · PROFESSIONAL ENGINEER

C-104

CS AND SPACE ADMINISTRATION
SPACE FLIGHT CENTER
S FLIGHT FACILITY
LAND, VIRGINIA 23337

GRAPHIC SCALE 0' 25' 50' 1"=25'

UAS AIRSTRIP – FINAL PLANS
PLAN VIEW – AIRSTRIP
DRAWING NO. 16140

JOHN D. HYNES & ASSOCIATES, INC.
32185 Beaver Run Drive • Salisbury, Maryland 21804
410-546-6462 / Fax: 410-548-5346

Project Location Map
Wallops Island UAS Runway and Port Integration Project
Wallops Island, Virginia

Date: March 23, 2021	
Scale: As Shown	
Drawn: GMB	
DWG. No. JDH-10/21/271-B-3	

HYNES & ASSOCIATES

LOG OF BORING B-3

George, Miles & Buhr
206 West Main Street
Salisbury, Maryland 21801

Wallops Island UAS Runway/Port Integration

Project No.: JDH-10/20/271

Date Completed:	: February 22, 2021
Logged By:	: A. Kus
Drilled By:	: M. Hynes
Drilling Method:	: Hand Auger
Total Depth:	: 5.5 feet

Depth in Feet	DESCRIPTION	GRAPHIC	USCS	Sample	REMARKS
0	Brown, wet, fine to medium SAND, with little to trace silt		SP-SM	1	Scale 1" ~ 7.75 feet
2				2	Approximately 4 inches of organic bearing soil was encountered at the ground surface.
4	Brown, saturated, fine to medium SAND, with trace silt		SP	3	
6	Boring terminated at 5.5 feet.				Groundwater was encountered at 4.5 feet during drilling operations.
8					
10					Laboratory Test Results
12					Sample No. 2 From 2 to 4 feet
14					Natural Moisture = 21.3%
16					
18					
20					
22					
24					
26					
28					
30					
32					
34					
36					
38					
40					
42					
44					
46					
48					
50					
52					

HYNES & ASSOCIATES

LOG OF BORING B-4

(Page 1 of 1)

George, Miles & Buhr
206 West Main Street
Salisbury, Maryland 21801

Wallops Island UAS Runway/Port Integration

Project No.: JDH-10/20/271

Date Completed:	: February 22, 2021
Logged By:	: A. Kus
Drilled By:	: M. Hynes
Drilling Method:	: Hand Auger
Total Depth:	: 5.5 feet

Depth in Feet	DESCRIPTION	GRAPHIC	USCS	Sample	REMARKS
0	Brown, wet, fine to medium SAND, with little to trace silt		SP-SM	1, 2	Scale 1" ~ 7.75 feet Approximately 4 inches of organic bearing soil was encountered at the ground surface. Groundwater was encountered at 5 feet during drilling operations.
4	Gray to brown, wet to saturated, fine to medium SAND, with trace silt		SP	3	
5.5	Boring terminated at 5.5 feet.				

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52

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HYNES & ASSOCIATES

LOG OF BORING B-5

(Page 1 of 1)

George, Miles & Buhr 206 West Main Street Salisbury, Maryland 21801	Date Completed: : February 22, 2021 Logged By: : A. Kus Drilled By: : M. Hynes Drilling Method: : Hand Auger Total Depth: : 5.5 feet
Wallops Island UAS Runway/Port Integration	
Project No.: JDH-10/20/271	

Depth in Feet	DESCRIPTION	GRAPHIC	USCS	Sample	REMARKS
0–4	Brown, wet, fine to medium SAND, with little to trace silt		SP-SM	1, 2	Scale 1" ~ 7.75 feet Approximately 3 inches of organic bearing soil was encountered at the ground surface. Groundwater was encountered at 4 feet during drilling operations.
4–5.5	Gray, saturated, fine to medium SAND, with trace silt		SP	3	
5.5	Boring terminated at 5.5 feet.				

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52

03-31-2021 J:\Mtech 2010\Wallops Island UAS Runway and Port Integration Project-20271\B-5.bor

HYNES & ASSOCIATES

LOG OF BORING B-6

(Page 1 of 1)

George, Miles & Buhr
206 West Main Street
Salisbury, Maryland 21801

Wallops Island UAS Runway/Port Integration

Project No.: JDH-10/20/271

Date Completed:	: February 22, 2021
Logged By:	: A. Kus
Drilled By:	: M. Hynes
Drilling Method:	: Hand Auger
Total Depth:	: 5.5 feet

Depth in Feet	DESCRIPTION	GRAPHIC	USCS	Sample	REMARKS
0–2	Brown, wet, fine to medium SAND, with little to trace silt		SP-SM	1	Scale 1" ~ 7.75 feet
2–4	Brown, wet, fine to medium SAND, with trace silt		SP	2	Approximately 3 inches of organic bearing soil was encountered at the ground surface.
4–5.5	Brown, saturated, fine to medium SAND, with little to trace silt		SP-SM	3	Groundwater was encountered at 4 feet during drilling operations.
	Boring terminated at 5.5 feet.				

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52

Laboratory Test Results

Sample No. 2
From 2 to 4 feet

Sieve Analysis

Sieve Size	Passing %
No. 4	100
No. 10	99.8
No. 20	98.6
No. 40	93.4
No. 60	75.4
No. 100	23.5
No. 200	9.0

Natural Moisture = 13.6%

HYNES & ASSOCIATES

LOG OF BORING B-7

George, Miles & Buhr
206 West Main Street
Salisbury, Maryland 21801

Wallops Island UAS Runway/Port Integration

Project No.: JDH-10/20/271

Date Completed: : February 22, 2021
Logged By: : A. Kus
Drilled By: : M. Hynes
Drilling Method: : Hand Auger
Total Depth: : 5.5 feet

Depth in Feet	DESCRIPTION	GRAPHIC	USCS	Sample	REMARKS
0–4	Brown, wet, fine to medium SAND, with little to trace silt		SP-SM	1, 2	Scale 1" ~ 7.75 feet Approximately 3 inches of organic bearing soil was encountered at the ground surface. Groundwater was encountered at 4 feet during drilling operations. Laboratory Test Results Sample No. 2 From 2 to 4 feet Natural Moisture = 20.5%
4–5.5	Brown, saturated, fine to medium SAND, with little silt		SM	3	
5.5	Boring terminated at 5.5 feet.				

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52

03-31-2021 J:\Mtech 2010\Wallops Island UAS Runway and Port Integration Project-20271\B-7.bor

HYNES & ASSOCIATES

LOG OF BORING B-8

George, Miles & Buhr
206 West Main Street
Salisbury, Maryland 21801

Wallops Island UAS Runway/Port Integration

Project No.: JDH-10/20/271

Date Completed: : February 22, 2021
Logged By: : A. Kus
Drilled By: : M. Hynes
Drilling Method: : Hand Auger
Total Depth: : 5.5 feet

Depth in Feet	DESCRIPTION	GRAPHIC	USCS	Sample	REMARKS
0–4	Brown, wet, fine to medium SAND, with little silt		SM	1, 2	Scale 1" ~ 7.75 feet Approximately 3 inches of organic bearing soil was encountered at the ground surface. Groundwater was encountered at 4 feet during drilling operations.
4–5.5	Brown to gray, saturated, fine to medium SAND, with little silt		SM	3	
5.5	Boring terminated at 5.5 feet.				

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52

03-31-2021 J:\Mtech 2010\Wallops Island UAS Runway and Port Integration Project-20271\B-8.bor

HYNES & ASSOCIATES

LOG OF BORING B-9

George, Miles & Buhr
206 West Main Street
Salisbury, Maryland 21801

Wallops Island UAS Runway/Port Integration

Project No.: JDH-10/20/271

Date Completed: : February 22, 2021
Logged By: : A. Kus
Drilled By: : M. Hynes
Drilling Method: : Hand Auger
Total Depth: : 5.5 feet

Depth in Feet	DESCRIPTION	GRAPHIC	USCS	Sample
0–2	Brown, wet, fine to medium SAND, with little to trace silt		SP-SM	1, 2
2–4	Dark brown, wet, fine to medium SAND, with little silt		SM	3, 4
4–5.5	Brown, saturated, fine to medium SAND, with little to trace silt		SP-SM	5
	Boring terminated at 5.5 feet.			

REMARKS

Scale 1" ~ 7.75 feet

Approximately 2 inches of organic bearing soil was encountered at the ground surface.

Groundwater was encountered at 4 feet during drilling operations.

Laboratory Test Results

Sample No. 4
From 3 to 4 feet

Natural Moisture = 26.8%

HYNES & ASSOCIATES

LOG OF BORING B-10

George, Miles & Buhr
206 West Main Street
Salisbury, Maryland 21801

Wallops Island UAS Runway/Port Integration

Project No.: JDH-10/20/271

Date Completed: : February 23, 2021
Logged By: : A. Kus
Drilled By: : B. Hynes
Drilling Method: : HSA (Geoprobe 7822 DT)
Total Depth: : 20.5 feet

Depth in Feet	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0–5.5	Brown, saturated, loose to medium dense, fine to medium SAND, with little silt		SM	1 2	3-4-4 3-5-6	Scale 1" ~ 7.75 feet Approximately 3 inches of organic bearing soil was encountered at the ground surface. Groundwater was encountered at 1 foot during drilling operations. At completion, water was at 1 foot; boring caved in at 3.5 feet.
5.5–8.5	Gray, saturated, loose, fine to medium SAND, with some silt, trace clay		SM	3	4-3-5	
8.5–12	Gray, saturated, very stiff, clayey SILT, with little fine to medium sand		ML	4	6-8-10	
12–20.5	Gray, saturated, loose, fine to medium SAND, with little to trace silt		SP-SM	5 6	5-4-3 3-3-3	

Boring terminated at 20.5 feet.

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52

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HYNES & ASSOCIATES

LOG OF BORING B-11

George, Miles & Buhr
206 West Main Street
Salisbury, Maryland 21801

Wallops Island UAS Runway/Port Integration

Project No.: JDH-10/20/271

Date Completed: : February 23, 2021
Logged By: : A. Kus
Drilled By: : B. Hynes
Drilling Method: : HSA (Geoprobe 7822 DT)
Total Depth: : 50.5 feet

Depth in Feet	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	Gray, saturated, loose to medium dense, fine to medium SAND, with little silt		SM	1	--	Scale 1" ~ 7.75 feet
4				2	1-5-7	Approximately 2 inches of gravel was encountered at the ground surface.
6				3	2-2-3	Groundwater was encountered at 3 feet during drilling operations.
8	Gray, saturated, very loose, fine to medium SAND and SILT, with trace clay		SM-ML	4	1-2-2	Boring caved in at 1 foot. Laboratory Test Results
12	Gray, saturated, very soft, silty CLAY, with trace fine to medium sand		CL			Sample No. 5 From 14 to 15.5 feet
14				5	WOH/18"	Atterberg Limits Liquid Limit = 49 Plasticity Index = 26 Natural Moisture = 41.0%
20				6	1-1-1	
24				7	1-1-1	
29				8	1-2-1	
34				9	1-1-2	
37	Gray, saturated, stiff to very stiff, silty CLAY, with trace fine to medium sand		CL			
39				10	4-6-9	
45				11	4-7-7	
50				12	6-7-8	
50.5	Boring terminated at 50.5 feet.					

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LOG OF BORING B-12

HYNES & ASSOCIATES

George, Miles & Buhr
206 West Main Street
Salisbury, Maryland 21801

Wallops Island UAS Runway/Port Integration

Project No.: JDH-10/20/271

Date Completed:	: February 23, 2021
Logged By:	: A. Kus
Drilled By:	: B. Hynes
Drilling Method:	: HSA (Mobile B-47 HD)
Total Depth:	: 50.5 feet

Depth in Feet	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0–8.5	Gray, saturated, loose, fine to medium SAND, with little silt		SM	1	--	Scale 1" ~ 7.75 feet
				2	4-3-3	Approximately 3 inches of gravel was encountered at the ground surface.
				3	4-5-5	Groundwater was encountered at 3 feet during drilling operations.
8.5–27	Gray, saturated, soft to very soft, silty CLAY, with little fine to medium sand		CH	4	1-2-2	Boring caved in at 1 foot. Laboratory Test Results Sample No. 4 From 9 to 10.5 feet Atterberg Limits Liquid Limit = 76 Plasticity Index = 44 Natural Moisture = 55.3%
				5	1-1-1	
				6	WOH/12"-1	
				7	WOH/18"-1	
27–37	Gray, saturated, soft to very soft, silty CLAY, with trace fine to medium sand		CL	8	1-1-1	
				9	1-2-2	
37–50.5	Gray, saturated, very stiff, silty CLAY, with trace fine to medium sand		CL	10	5-8-9	
				11	6-7-9	
				12	7-7-7	

Boring terminated at 50.5 feet.

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HYNES & ASSOCIATES

LOG OF BORING B-13

George, Miles & Buhr
206 West Main Street
Salisbury, Maryland 21801

Wallops Island UAS Runway/Port Integration

Project No.: JDH-10/20/271

Date Completed: : February 22, 2021
Logged By: : A. Kus
Drilled By: : M. Hynes
Drilling Method: : HSA (Mobile B-47 HD)
Total Depth: : 20.5 feet

Depth in Feet	DESCRIPTION	USCS	Sample	Blow Count
0–8	Brown to gray, saturated, medium dense, fine to medium SAND, with little silt, trace gravel	SM	1 2 3	6-6-7 9-6-12 8-10-12
8–12	Brown to gray, saturated, dense, fine to medium SAND, with little silt	SM	4	11-14-18
12–17	Gray, saturated, medium dense, fine to medium SAND and SILT, with trace clay	SM-ML	5	4-7-9
17–20.5	Gray, saturated, medium stiff, clayey SILT, with trace fine to medium sand	ML	6	3-3-4
20.5	Boring terminated at 20.5 feet.			

REMARKS

Scale 1" ~ 7.75 feet

Approximately 4 inches of gravel was encountered at the ground surface.

Groundwater was encountered at 3 feet during drilling operations.

At completion, water was at 3 feet, boring caved in at 3 feet.

Laboratory Test Results

Sample No. 2
From 3 to 4.5 feet

Natural Moisture = 24.5%

HYNES & ASSOCIATES

LOG OF BORING B-14

(Page 1 of 1)

George, Miles & Buhr
206 West Main Street
Salisbury, Maryland 21801

Wallops Island UAS Runway/Port Integration

Project No.: JDH-10/20/271

Date Completed: : February 22, 2021
Logged By: : A. Kus
Drilled By: : M. Hynes
Drilling Method: : HSA (Mobile B-47 HD)
Total Depth: : 50.5 feet

Depth in Feet	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count
0–6	Brown, saturated, medium dense, fine to medium SAND, with little silt, trace gravel		SM	1	5-8-8
				2	7-10-14
6–12	Gray, saturated, medium dense, fine to medium SAND, with trace silt		SP	3	7-7-6
				4	7-4-5
12–17	Gray, saturated, medium dense, fine to medium SAND, with some to little silt, trace clay		SM	5	4-5-6
17–32	Gray, saturated, very soft to soft, silty CLAY, with trace fine to medium sand		CL	6	2-2-2
				7	2-1-2
				8	2-2-3
32–37	Gray, saturated, stiff, silty CLAY, with trace fine to medium sand		CL	9	2-4-8
37–42	Gray, saturated, very stiff, clayey SILT, with little fine to medium sand		ML	10	8-9-10
42–50.5	Gray, saturated, very stiff, silty CLAY, with little shells, trace fine to medium sand		CL	11	6-9-11
				12	9-9-10
	Boring terminated at 50.5 feet.				

REMARKS

Scale 1" ~ 7.75 feet

Approximately 4 inches of gravel was encountered at the ground surface.

Groundwater was encountered at 3 feet during drilling operations.

At completion, water was at 3 feet, boring caved in at 3 feet.

Laboratory Test Results

Sample No. 6
From 19 to 20.5 feet

Atterberg Limits

Liquid Limit = 36
Plasticity Index = 15
Natural Moisture = 31.9%

HYNES & ASSOCIATES

LOG OF BORING B-15

George, Miles & Buhr
206 West Main Street
Salisbury, Maryland 21801

Wallops Island UAS Runway/Port Integration

Project No.: JDH-10/20/271

Date Completed: : February 22, 2021
Logged By: : A. Kus
Drilled By: : M. Hynes
Drilling Method: : HSA (Mobile B-47 HD)
Total Depth: : 50.5 feet

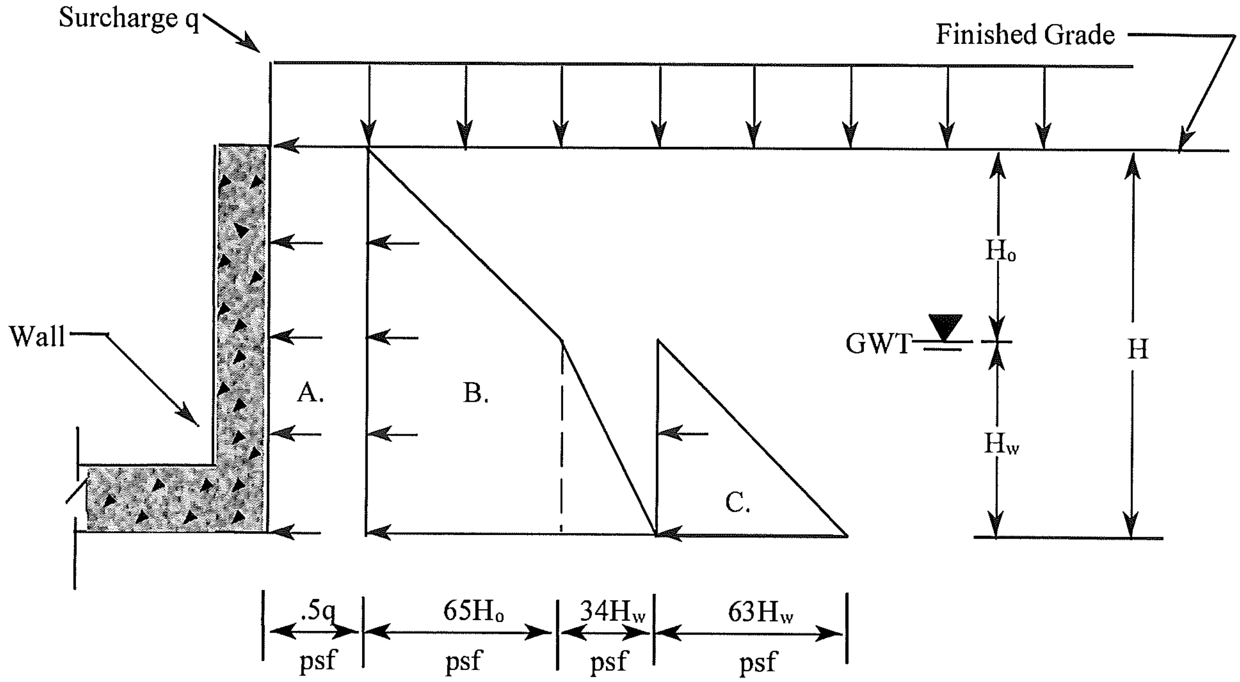
Depth in Feet	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0–5.5	Brown, gray, saturated, medium dense, fine to medium SAND, with little to trace silt		SP-SM	1 2	5-6-8 8-7-7	Scale 1" ~ 7.75 feet Approximately 4 inches of gravel was encountered at the ground surface. Groundwater was encountered at 3 feet during drilling operations. At completion, water was at 3 feet, boring caved in at 3 feet.
5.5–8.5	Gray, saturated, medium dense, fine to medium SAND, with little silt, trace clay		SM	3	8-12-14	
8.5–12	Gray, saturated, medium dense, fine to medium SAND, with trace silt		SP	4	4-7-9	
12–17	Gray, saturated, medium dense, fine to medium SAND, with little silt, trace clay		SM	5	5-7-9	
17–20.5	Gray, saturated, loose, fine to coarse SAND, with little shells, trace silt		SP	6	9-3-3	

Boring terminated at 20.5 feet.

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52

03-31-2021 J:\Mtech 2010\Wallops Island UAS Runway and Port Integration Project-20271\B-15.bor

EARTH PRESSURE REQUIREMENTS
FOR
BELOW GRADE WALLS (UNDRAINED)



A. Lateral Surcharge
B. Lateral Soil Pressure
C. Hydrostatic Pressure

1. Pressure diagram assumes undrained soil conditions.
2. Pressure diagram assumes at rest soil pressures on cantilevered walls or walls with one support level.
3. For backfill, use non-plastic SP or better quality material (ASTM D-2487).
4. Compact backfill in maximum 8-inch loose lifts to 92 to 95 percent maximum dry density (ASTM D-1557).
5. Use only light-duty hand operated compaction equipment within 10 feet of walls.
6. For surcharge q, consider the greater of the maximum expected construction equipment live loads or permanent structure dead and live loads.
7. For temporary retaining walls used for excavation support, use 2/3 of the above values for lateral surcharge and soil pressures. This reflects the active soil pressure condition.

HYNES **JOHN D. HYNES & ASSOCIATES, INC.** 32185 Beaver Run Drive • Salisbury, Maryland 21804 410-546-6462 / Fax: 410-548-5346	**Date: March 30, 2021** **Scale: Not to Scale** **DRAWN: JDH**
Earth Pressure Requirements for Below Grade Walls (Undrained) Wallops Island UAS Runway and Port Integration Project Walops Island, Virginia	**DWG. No.** **JDH-10/20/271-C**

SUMMARY OF LABORATORY CBR TEST RESULTS
UAS RUNWAY - WALLOPS ISLAND FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA
MTL PROJECT 10-12537

			ATTERBERG LIMITS (ASTM D 4318)				SOIL CLASSIFICATION	MOISTURE DENSITY TEST (VTM-1)		CALIFORNIA BEARING RATIO TEST (VTM-8)		
SAMPLE NO.	SAMPLE DEPTH (FT.)	NATURAL PERCENT MOISTURE (ASTM D 2216)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	PERCENT FINER THAN A #200 SIEVE (ASTM D 1140)	AASHTO M 145 (ASTM D 2487)	MAXIMUM DRY DENSITY (PCF)	OPTIMUM MOISTURE (%)	SOAKED C.B.R. VALUE	PERCENT COMPACTION BEFORE SOAKING	PERCENT SWELL
CBR-1	0.3 - 1.3	1.9	17	NP[1]	NP[1]	0.9	A-3 (SP)	94.1	16.2	18.4	100.0	-0.033
CBR-2	0.3 - 1.3	24.7	17	NP[1]	NP[1]	4.0	A-3 (SP)	94.5	15.7	16.9	99.9	-0.083
CBR-3	0.5 - 1.5	28.6	17	NP[1]	NP[1]	10.6	A-2-4 (SP-SM)	99.1	15.2	15.0	98.6	-0.100
CBR-4	0.2 - 1.2	9.0	16	NP[1]	NP[1]	0.9	A-3 (SP)	95.9	18.9	19.0	99.0	-0.067
CBR-5	0.2 - 1.2	2.8	17	NP[1]	NP[1]	0.7	A-3 (SP)	94.9	18.8	17.2	99.6	-0.050
CBR-6	0.2 - 1.2	18.6	16	NP[1]	NP[1]	0.9	A-3 (SP)	95.1	18.3	20.0	99.9	-0.117
CBR-7	0.2 - 1.2	1.1	16	NP[1]	NP[1]	1.4	A-3 (SP)	94.1	19.5	20.5	100.0	+0.017
CBR-8	0.2 - 1.2	12.7	17	NP[1]	NP[1]	1.7	A-3 (SP)	98.5	17.2	17.0	99.0	-0.150
CBR-9	0.2 - 1.2	8.7	17	NP[1]	NP[1]	23.9	A-2-4 (SM)	119.4	10.1	14.2	97.7	-0.017
CBR-10	0.2 - 1.2	5.5	17	NP[1]	NP[1]	3.8	A-3 (SP)	106.5	14.3	19.6	99.9	-0.117
CBR-11	0.2 - 1.2	9.1	17	NP[1]	NP[1]	2.5	A-3 (SP)	96.6	19.2	16.3	98.9	+0.050
CBR-12	0.2 - 1.2	3.8	16	NP[1]	NP[1]	1.0	A-3 (SP)	96.7	17.5	20.3	99.0	-0.067

Notes: 1) Denotes Non-Plastic Soils

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FIELD CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

NON-COHESIVE SOILS
(Silt, Sand, Gravel and Combinations)

DENSITY

Very Loose	- 5 blows/ft. or less
Loose	- 6 to 10 blows/ft.
Medium Dense	- 11 to 30 blows/ft.
Dense	- 31 to 50 blows/ft.
Very Dense	- 51 blows/ft. or more

RELATIVE PROPORTIONS

Descriptive Term	Percent
Trace	1 - 10
Little	11 - 20
Some	21 - 35
And	36 - 50

PARTICLE SIZE IDENTIFICATION

Boulders	- 8 inch diameter or more
Cobbles	- 3 to 8 inch diameter
Gravel	- Coarse - 1 to 3 inch
	- Medium - 1/2 to 1 inch
	- Fine - 4.75 mm to 1/2 inch
Sand	- Coarse - 2.0 mm to 4.75 mm
	- Medium - 0.425 mm to 2.0 mm
	- Fine - 0.075 mm to 0.425 mm
Silt	- 0.075 mm to 0.002 mm

COHESIVE SOILS
(Clay, Silt and Combinations)

CONSISTENCY

Very Soft	- 3 blows/ft. or less
Soft	- 4 to 5 blows/ft.
Medium Stiff	- 6 to 10 blows/ft.
Stiff	- 11 to 15 blows/ft.
Very Stiff	- 16 to 30 blows/ft.
Hard	- 31 blows/ft. or more

PLASTICITY

Degree of Plasticity	Plasticity Index
None to Slight	0 - 4
Slight	5 - 7
Medium	8 - 22
High to Very High	over 22

Classification on logs are made by visual inspection of samples unless a sample has been subjected to laboratory classification testing.

Standard Penetration Test - Driving a 2.0" O.D., 1-3/8" I.D., splitspoon sampler a distance of 1.0 foot into undisturbed soil with a 140 pound hammer free falling a distance of 30.0 inches. It is customary to drive the spoon 6 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and making the test are recorded for each 6 inches of penetration on the drill log (Example - 6/8/9). The standard penetration test value (N - value) can be obtained by adding the last two figures (i.e. 8 + 9 = 17 blows/ft.). (ASTM D-1586)

Strata Changes - In the column "Soil Descriptions," on the drill log, the horizontal lines represent strata changes. A solid line (—) represents an actually observed change, a dashed line (----) represents an estimated change.

Groundwater - Observations were made at the times indicated. Porosity of soil strata, weather conditions, site topography, etc. may cause changes in the water levels indicated on the logs.

HYNES

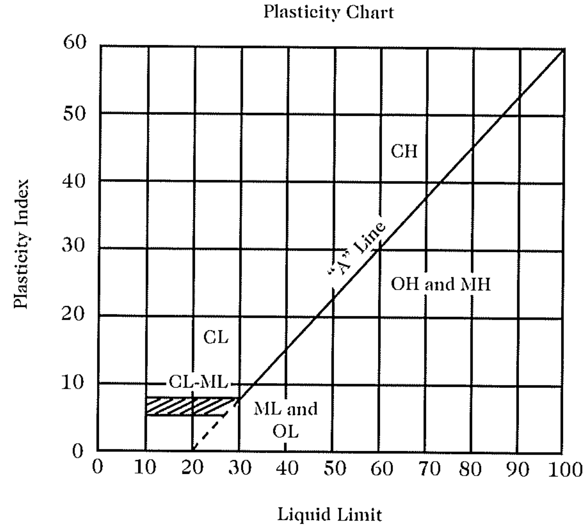
JOHN D. HYNES & ASSOCIATES, INC.

Geotechnical and Environmental Consultants
Monitoring Well Installation
Construction Inspection and Materials Testing

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions			*Group Symbols*	*Typical Names*	*Laboratory Classification Criteria*		
Coarse-grained soils (More than half of material is larger than No 200 sieve size)	Gravels (More than half of coarse fraction is larger than No 4 sieve size)	Clean gravels (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No 200 sieve size), coarse grained soils are classified as follows: Less than 5 percent GW, GP, SW, SP; More than 12 percent GM, GC, SM, SC; 5 to 12 percent *Borderline cases requiring dual symbols*[b]	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			GP	Poorly graded gravels, gravel sand mixtures, little or no fines		Not meeting all graduation requirements for GW	
		Gravels with fines (Appreciable amount of fines)	GM[a] d / u	Silty gravels, gravel-sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7	
	Sands (More than half of coarse fraction is smaller than No 4 sieve size)	Clean sands (Little or no fines)	SW	Well-graded sands, gravelly sands,		$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			SP	Poorly graded sands, gravelly sands, little or no fines		Not meeting all graduation requirements for SW	
		Sands with fines (Appreciable amount of fines)	SM[a] d / u	Silty sands, sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols.
			SC	Clayey sands, sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7	
Fine-grained soils (More than half material is smaller than No 200 sieve)	Silts and clays (Liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity			
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays			
			OL	Organic silts and organic silty clays of low plasticity			
	Silts and clays (Liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts			
			CH	Inorganic clays of high plasticity, fat clays			
			OH	Organic clays of medium to high plasticity, organic silts			
Highly organic soils			Pt	Peat and other highly organic soils			

Plasticity Chart



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Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GBC GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
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e-mail: info@geoprofessional.org www.geoprofessional.org

ATTACHMENT 3: DREDGING ESTIMATES MEMORANDUM

Wallops Island Northern Development (WIND) Project

DRAFT Memorandum: Dredge Estimates

6/5/2022

Introduction

Estimates of future maintenance dredging volumes have been developed for the proposed vessel approach channel for the Wallops Island Northern Development project. The estimates were divided geographically into two regions due to differing hydrodynamic and sediment conditions. The first region is in the inlet area which corresponds to the north/south alignment of the proposed vessel approach channel that would connect to the federal navigation channel in the vicinity of Buoy 11 (see Figure 1). This section of the channel is also designated in Figure 2 with the solid lined red rectangle. The second region, which corresponds to the east/west alignment of the proposed vessel approach channel, is also shown in Figure 2 and is designated by the dashed black rectangle. The proposed vessel approach channel would be 100 feet (ft) wide and is expected to be dredged initially to 9 ft below Mean Lower Low Water (MLLW). In a subsequent phase, the channel would be dredged to 12 ft below MLLW. Both depths are designated the maximum dredge depth and include any advanced dredging and over-dredging.

Figure 1. Location of Proposed Vessel Approach Channel tie-in to Federal Navigation Channel

In Region 1, sediment transport is influenced by both tidal and wind driven currents and waves generated offshore and propagating into the bay. Region 2 is more sheltered, and less influenced by waves.

For Region 1, the federal navigation channel maintenance dredge records were used to develop estimates of future dredging requirements for the proposed vessel approach channel. The federal navigation channel has similar dimensions to the proposed channel for both width and depth, and its dredging history can be considered a surrogate estimating future maintenance dredging for the proposed Region 1 channel. In addition to the historic dredge records, survey data at the north end of the proposed channel was reviewed to gain insight into potential future dredging needs. Surveys were conducted in both 2019 and 2021 and the changes in the bathymetry based on those surveys provides another estimate of future dredging volume.

For Region 2, the basis of estimates is the channel dredging records near Harbor Refuge. The Harbor Refuge has similar sheltering conditions and provides a surrogate for estimating future dredging requirements for Region 2 of the proposed vessel approach channel.

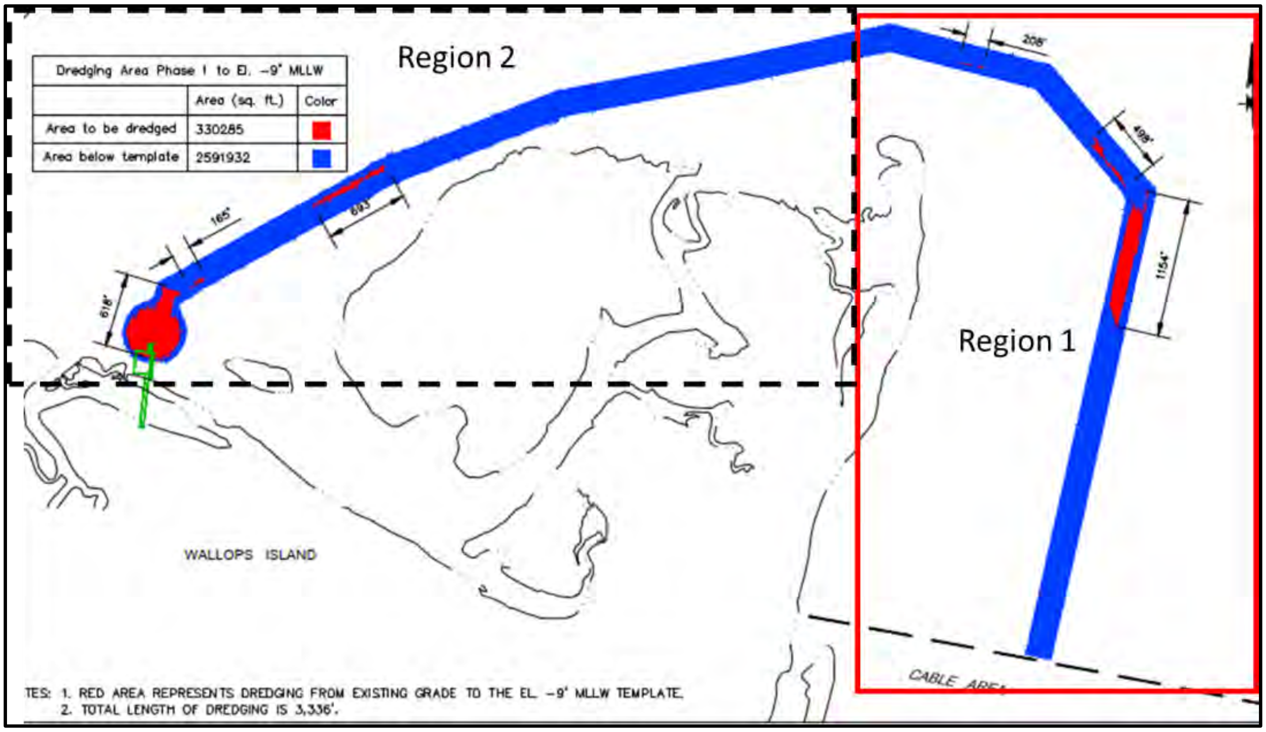


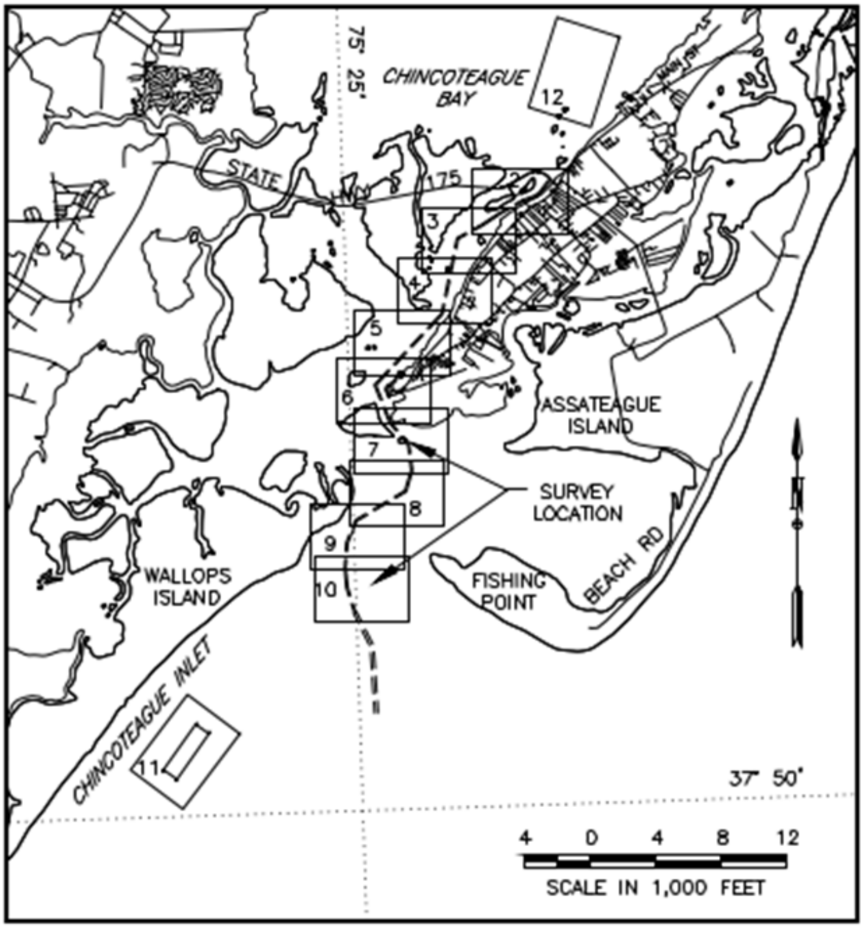
Figure 2. Division of Proposed Channel into two Regions for Dredge Analysis

Dredging Estimates for Region 1

Historic dredging records for the federal navigation channel were made available by the USACE Norfolk District. The data was provided in various formats, including contour plots of pre- and post-survey data, summaries of historic dredging volumes in PowerPoint files and Excel sheets with contract data and dredge volume data. Of the data provided, a table in one of the PowerPoint files, shown below in Figure 3, and a few of the pre-dredge survey documents provided the most useful data. The other source of data were the pre-dredge surveys, which included estimates of the dredge volumes by section. An example of the data is shown in Figure 4.

Project	FY	Start	End	Days	CY	Method
CHINCOTEAGUE INLET	1993	06-MAR-93	19-MAR-93	13	112,169	Contract
CHINCOTEAGUE INLET	1994	26-MAR-94	08-APR-94	13	123,333	Contract
CHINCOTEAGUE IN. OCEAN BAR	1995	15-MAR-95	05-APR-95	21	120,835	Contract
CHINC INLET - OCEAN BAR	1996	22-JUN-96	21-JUL-96	29	120,079	Contract
CHINC. INLET OCEAN BAR	1997	01-OCT-97	09-NOV-97	39	122,898	Contract
CHINC. BAY GREENBACKVILLE	1997	20-MAY-97	22-MAY-97	2	9,605	Contract
CHINC. HBR. REFUGE	1997	24-MAY-97	25-MAY-97	1	4,771	Contract
CHINCOTEAGUE INLET OCEAN BAR	1998	16-JUL-98	31-JUL-98	15	72,592	Contract
Chincoteague Inlet	2002	01-SEP-02	31-OCT-02	60	91,292	Contract
Chincoteague Bay	2002	10-SEP-02	17-OCT-02	37	11,422	Contract
Chincoteague Harb. of Refuge	2003	03-AUG-03	10-AUG-03	7	11,885	Contract
Chincoteague Inner Channel	2003	30-NOV-03	10-DEC-03	10	12,261	Contract
Chincoteague, VA	2005	16-MAR-05	27-MAR-05	11	12,455	Currituck
Chincoteague Inlet Ocean Bar	2006	01-MAR-06	24-MAR-06	23	71,009	Contract
Chincoteague Coast Guard	2007	15-OCT-07	15-DEC-07	61	10,347	Contract
Chincoteague, VA	2007	23-AUG-07	11-SEP-07	19	28,345	Contract
Chincoteague Inlet Ocean Bar	2008	20-FEB-08	06-MAR-08	15	63,841	Contract
Chincoteague Bay Channel	2009	08-SEP-09	20-NOV-09	73	13,353	Contract
Chincoteague Harbor of Refug	2009	02-SEP-09	17-OCT-09	45	5,558	Contract
Chincoteague, VA	2009	29-NOV-08	20-DEC-08	21	32,545	Currituck
Chincoteague, VA	2010	02-JUL-10	22-JUL-10	20	41,275	Currituck
Chincoteague, VA	2011	08-MAR-11	30-MAR-11	22	54,380	Currituck
Chincoteague, VA	2011	27-SEP-11	30-SEP-11	3	3,075	Currituck
Chincoteague, VA	2012	11-MAR-12	17-MAR-12	6	9,680	Currituck
Chincoteague, VA	2012	30-JAN-12	10-FEB-12	11	1,550	Currituck
Chincoteague, VA	2012	13-SEP-12	21-SEP-12	8	13,390	Currituck
Chincoteague, VA	2012	18-DEC-11	19-DEC-11	1	1,270	Currituck
Chincoteague, VA	2013	13-DEC-12	19-DEC-12	6	17,795	Currituck
Chincoteague, VA	2014	05-NOV-13	09-NOV-13	4	3,575	Murden
Chincoteague, VA	2014	20-FEB-14	03-MAR-14	11	11,015	Murden
Chincoteague Inlet, VA	2014	11-AUG-14	04-SEP-14	24	24,315	Murden
Chincoteague, VA	2014	19-DEC-13	30-JAN-14	42	29,505	Murden
Chincoteague, VA	2015	15-JAN-15	15-FEB-15	31	13,300	Murden
Chincoteague, VA	2016	15-DEC-15	29-DEC-15	14	3,600	Murden
Chincoteague, VA	2017	5-NOV-16	7-NOV-16	2	2,195	Currituck
Chincoteague, VA	2017	08-DEC-16	11-DEC-16	3	3,960	Currituck

Figure 3. Norfolk District Dredging Records



DREDGING AREA LOCATION	STATION TO STATION	CUBIC YARDS PLACE MEASUREMENT		
		TO 9 FT	2 FT O.D. ALLOWABLE	TOTAL
INNER CHANNEL	56+00 – 65+00	200	3,000	3,200
INNER CHANNEL	90+00 – 101+00	3,000	3,200	6,200
INNER CHANNEL	250+00 – 264+00	10,800	9,800	20,600
INNER CHANNEL	299+00 – 306+00	1,400	2,900	4,300
ESTIMATED ACCRETION TO NOV 2013		0,000	0,000	3,000
TOTAL		15,400	18,900	37,300

Figure 4. Example of Dredge Estimate data from Norfolk District

One of the difficulties in analyzing the data is relating the location of the recorded or estimated dredge data to the physical location along the channel. This is necessary to assure that only dredge data pertaining to Region 1 is used. The channel length of interest extends from Buoy 11 at the south end to approximately Buoy 16 at the north end. For the digital files with the estimated dredging requirements (pre-dredge surveys), the data could be reasonably located using the along-channel station-to-station information provided both in the volume estimate table and on the survey sheets. For the historic dredge data table, the only indicator is the project name, which provides some indication of the location but is not definitive.

Therefore, two approaches were used to provide maintenance dredging estimates. In the first, the dredge estimates from the pre-dredge surveys were combined with data from the historic data table. When using data form the historic data table, only those projects indicated as Chincoteague Inlet were used, and only those after 2002. In the second estimate, all the data in the historic data table that included the project name Chincoteague, VA or Chincoteague Inlet were used.

The data from the pre-dredge surveys and limited records from the Historic Dredge Table are summarized in Table 1. The data indicate an average annual dredging requirement of 14,569 cubic yards (cy). The data also indicate variable intervals between dredging, on the order of 1 and 4 years. Note that these volumes correspond to maintaining a navigable depth of 9 feet below MLLW and include a 2-ft over-dredge (to 11' MLLW). The dredging for the proposed vessel approach channel is to 9' MLLW including over-dredging. Thus, the volumes presented in Table 1 are likely high for the proposed channel and need to be reduced to account for the difference in dredge depths between the proposed channel and federal channel (maximum of 9' vs. 9'+2').

Table 1. Summary of Dredge Records for Region 1 using Approach 1 (11-ft depth)

Year	Volume (cy)	Annualized (cy/yr)
2002	-	-
2009	92,161	13,166
2013	24,900	6,225
2014	24,315	24,315
	Average	**14,569**

The 2013 pre-dredge survey provided dredging estimates for both a 9-ft targeted depth and the additional volume associated with the over dredging to 11 ft below MLLW within the Region 1 footprint. This data provides a basis for estimating the dredge volumes for the 9' proposed channel based on volumes recorded for the federal channel of 11' (9'+2'). The volume required to reach 9-ft below MLLW was 10,800 cy and to reach 11 ft below MLLW was 24,000 cy. These data indicate that the estimated dredge volumes for a 9' depth below MLLW is 48.9% of the volume dredged to reach 11' below MLLW. This percentage was used to estimate the proposed channel volumes using the federal channel volumes. The final values are summarized in Table 2 and were calculated by multiplying the value sin Table 1 by 48.9%.

Table 2. Summary of Dredge Records for Region 1 using Approach 1 (9-ft depth)

Year	Volume (cy)	Annualized (cy/yr)
2002	-	-
2009	44,237	6,320
2013	11,952	2,988
2014	11,671	11,671
average	**22,620**	**6,993**

The data for the second approach for Region 1 is summarized in Table 3. The data based on the federal channel dredge records were reduced by 48.9% to estimate the volumes associated with the 9' depth (below MLLW). The data indicate an average annual dredging requirement of 12,109 cy, with annual rates ranging from 1,793 cy to 33,570 cy. The interval between dredging events ranges from 1 year to 3 years.

Table 3. Summary of Dredge Records for Region 1 using Approach 2 (9 ft below MLLW depth)

Year	Volume (cy)	Annualized (cy/yr)
2002	-	-
2002	-	-
2005	6,203	2,068
2007	14,116	7,058
2009	16,207	8,104
2010	20,555	20,555
2011	28,613	28,613
2012	12,893	12,893
2013	8,862	8,862
2014	33,570	33,570
2015	6,623	6,623
2016	1,793	1,793
2017	3,065	3,065
average	**13864**	**12109**

A subsequent phase of the project includes dredging the vessel approach channel to 12 ft below MLLW (with an additional 2-ft over-dredge). The 2013 data used to convert 11 dredge depths to 9-foot dredge depths was also used to convert from the 11-foot to 12-foot dredge depths. The analysis indicates that the 12-foot dredge depth is approximately 1.25 times the 11-foot dredge depth, or 2.56 times the 9-foot dredge depth. The estimated values are summarized in Table 4.

Table 4. Summary of Region 1 Annual Average Maintenance Dredging Requirements

Estimated Dredge Requirements	9'(cy/yr)	12' (cy/yr)
Approach 1	6,993	17,902
Approach 2	12,109	30,999

The January 2019 and January 2021 bathymetric survey data provide additional insight into future dredging requirements in Region 1. The 2019 and 2021 survey extent and track lines are shown in **Figure 5** (Panel A) and the survey data are contoured in **Figure 5** (Panels C and D). The proposed channel alignment, as indicated in **Figure 5** (Panel C) was selected to follow the deepest bathymetry (red and green regions) and runs between two shoals (blue areas in contour plot). The 2021 survey (Panel D) indicates significant changes in the local bathymetry, with sediment shoaling along the proposed channel. The two survey data sets were plotted along three channel transects, one along the channel (brown line in Panel B) and two cross-channel transects (T1 and T2 in Panel D).

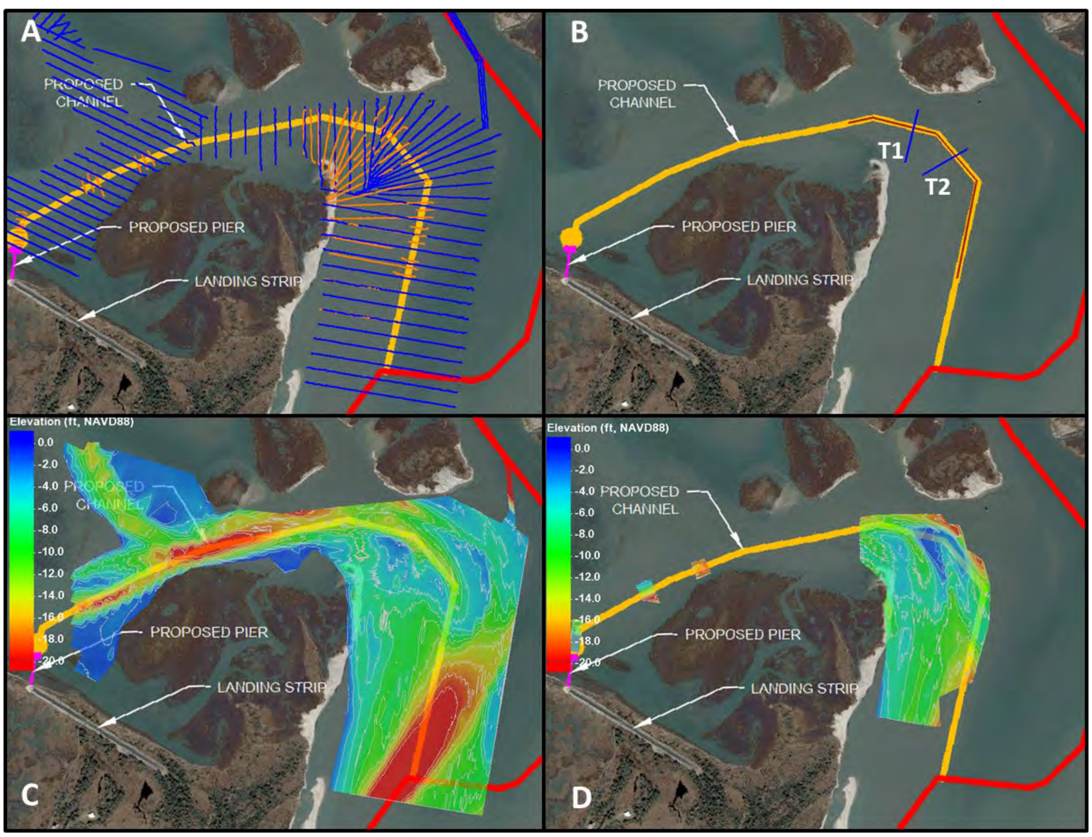


Figure 5. 2019 and 2021 Survey Data (Panel A: blue = 2019, orange = 2021)

The cross-channel transect data are shown in **Figure 6** and indicate significant shoaling along the proposed channel alignment, which is in the vicinity of 800 feet along the transect. The changes are on the order of 6 to 10 feet of accretion. A plot of the survey data along the channel is shown in **Figure 7**. The plot also includes the 9-ft and 12-ft below MLLW elevations representing the Phase 1+2 and Phase 3 channel elevations. The shoaling is very evident in the 1,000 to 3,000-ft range and represents a considerable impact to the maintenance dredging. An estimate of the potential maintenance dredging, represented by the 2019 to 2021 bathymetric changes, was made by considering the 2021 survey elevations above the 9-ft and 12-ft below MLLW elevations. The green shaded area represents the amount of dredging needed to return the proposed channel to the 9 ft below MLLW elevation. Assuming a 100-ft wide channel, the associated volume is approximately 59,500 cy. A similar analysis was applied to the 12-ft below MLLW elevation, yielding a dredge volume of 104,500 cy.

The primary forcing causing these significant changes has not been identified, but several storms passed through the area during the interval between the two surveys, including Tropical Storm Fay in July 2020, Hurricane Isaias in August 2020, and a nor'easter on December 16, 2020. The annualized dredging requirements for the bathymetric changes is 29,700 cy for 9 ft below MLLW and 52,200 cy for 12 ft below MLLW channel elevation. These values are higher than those obtained using the federal channel dredging records. However, the approach implicit in the calculation of these values does not reflect the channel re-alignment strategy used by the USACE which, if implemented, would likely lead to smaller dredge volumes.

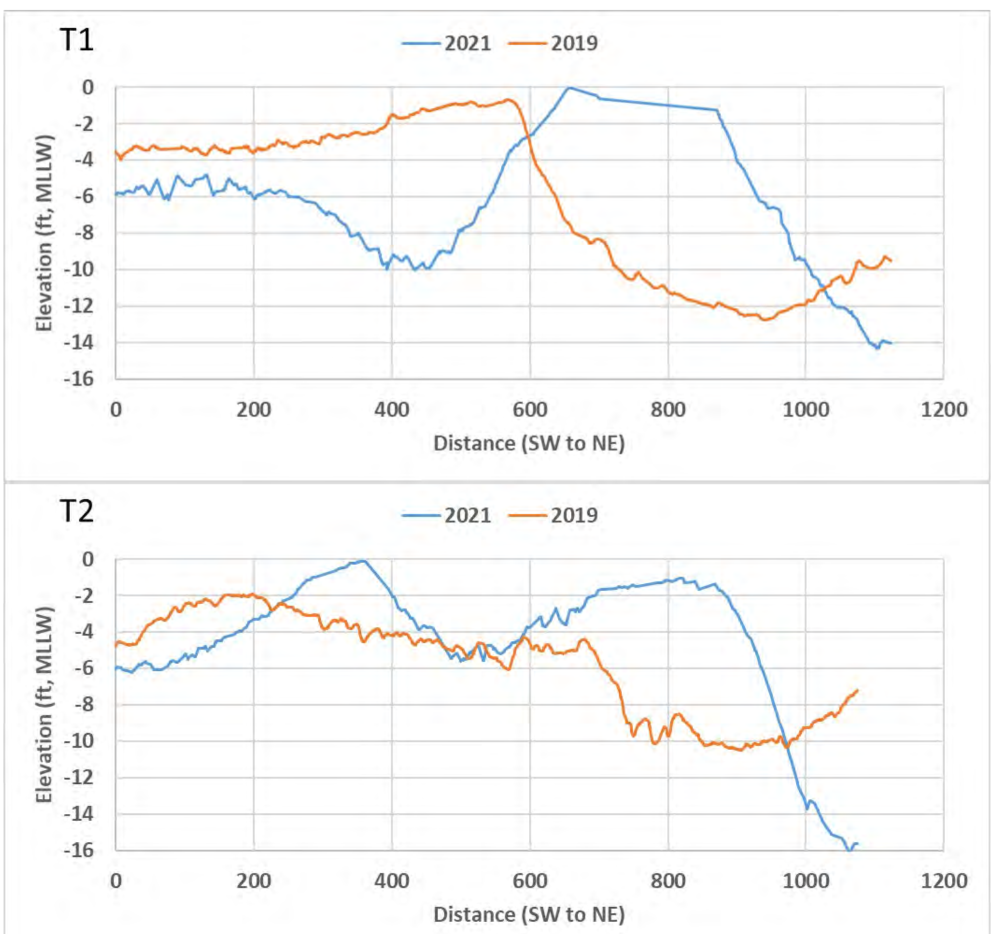
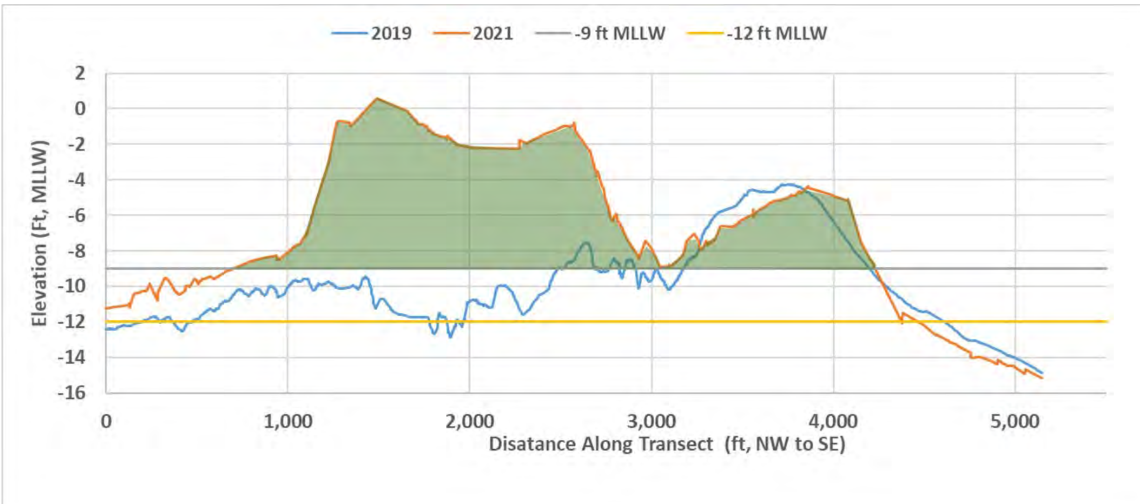


Figure 6. Survey Data Along Cross-Channel Transects



Dredging Estimates for Region 2

A similar procedure to that applied in Region 1 was applied to Region 2, using the records from Harbor Refuge. This area is sheltered from significant wave action, much like the Region 2 section of the proposed channel and is the best available data. A summary of the available data and associated annual average dredge volumes is provided in Table 5.

Table 5. Summary of Dredge Records for Harbor of Refuge (8' +2')

Year	Volume (cy)	Annualized (cy/yr)
1997	-	-
2003	11,885	1,981
2009	5,558	926
	Average	**1,454**

The data need to be adjusted to account for channel length and dredge depths. The federal navigation channel in the vicinity of Harbor of Refuge is 8 ft below MLLW.

As pointed out previously, the exact location of the historic dredging is not clear. Therefore, an approximately 4,000-ft length of channel associated with the dredge events was estimated based on engineering judgement. The length of the proposed vessel approach channel in Region 2 is approximately 6,000 feet. Thus, the historic volumes need to be adjusted upwards by approximately 50% to account for the differences in channel lengths.

To account for the difference in channel depths, the same strategy used for Region 1 adjustments from 11' to 9' were applied, but in this case are from 10' to 9', yielding an adjustment of 65.7%. Applying the length and depth adjustments yields a total annual average maintenance dredge volume of 1,432 cy/yr.

According to the historic records, dredging is required on the average every six years. At that interval, it is expected that 8,600 cy would need to be dredged every six years (on average).

For the 12-ft below MLLW proposed channel depth, the same approach used for Region 1 was also applied, yielding an annual average maintenance dredge volume of 2,400 cy/yr.

Summary

Estimates of future maintenance dredging requirements have been made using historic dredge records made available by the Norfolk District of the USACE. The Wallops Island Northern Development Project proposed vessel approach channel was divided into two regions for analysis, based on hydrodynamic forcing considerations. Historic dredge data relevant to each area was revised and used to estimate future dredging requirements for the channel sections within each region.

The estimated volumes are provided on an annual average basis. The dredging interval is likely to be highly variable, based on the historic data. The federal navigation channel dredging records indicate that channel migration has occurred, and the 2019 and 2021 survey data show large naturally occurring changes in the bathymetry that could require dredging to maintain the proposed channel alignment.

The Federal channel is re-aligned periodically to follow the migrating, naturally deep channel and to minimize dredging quantities. VA Space is proposing to permit a similar channel re-alignment strategy in the “Region 1” area of the proposed channel. Thus, the USACE dredging records are a reasonable surrogate for Region 1.

It is recommended that the estimated maintenance dredge volumes be used to support cost projections. However, the dredging interval, volume, and location of the actual dredging would vary, and it is not feasible to make projections for the locations and volumes in any more detail.

ATTACHMENT 4: BATHYMETRY INFORMATION

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GBA
ENGINEERS ★ SURVEYORS

January 10, 2020

Mr. Nathan Overby, PE
Virginia Commercial Space Flight Authority (VCSFA)
4111 Monarch Way, Suite 303
Norfolk, VA 23505

Subject: **Mid-Atlantic Regional Spaceport (MARS)**
Wallops Island M95 Intermodal Barge Service Project
IDIQ Task No 1 of Task Order 01 Preliminary Small Vessel Channel

Dear Mr. Overby,

Gahagan & Bryant Associates, Inc. (GBA) is providing the following engineering assessment for the Small Vessel Approach Channel and Basin as required by Task 1 of Task Order 01 under Contract VCSFA-GBA-08012019.

This report satisfies Task 1 of Task Order 01, the Preliminary Small Vessel Approach Channel/Harbor Engineering. The completion of Task 2 of Task Order 01, the Pre-joint Application Meeting and Support Planning, has been extended until spring 2020 when VCSFA, NASA and the agencies begin formal discussions for the Environmental Assessment.

This engineering assessment for the Small Vessel Approach Channel and Basin is intended to assist with project planning and budgeting. We are looking forward to continued involvement during the Environmental Assessment process, as well as, the additional pending Task Orders for the other design elements.

Feel free to contact me if you have any questions or if we can provide further assistance.

Kind regards,
GAHAGAN & BRYANT ASSOCIATES, INC.

William A. Murchison
Senior Associate

IDIQ Task No 01
Subtask 1 PRELIMINARY SMALL VESSEL APPROACH CHANNEL/HARBOR ENGINEERING

Introduction

The Virginia Commercial Space Flight Authority (VCSFA) is developing a harbor and improving existing waterfront facilities for use with unmanned vehicle test systems and operations, including a small barge and research vessel access channel leading to a pier and combination dock/ramp for loading. VCSFA has requested GBA to prepare a preliminary engineering assessment for the Small Vessel Channel.

Subtask 1.1 Geotechnical Data Review and Planning

GBA researched existing geotechnical data for the area in the vicinity of the proposed Wallops Island Intermodal Port Access Channel. While the United States Army Corps of Engineers (USACE) designates two waterways in this area (Chincoteague Inlet Channel and Chincoteague Inlet to Bogues Bay Connecting Waters), no USACE boring data has yet to be found for this area. NASA has proposed two borings independent of the Intermodal Port project, one of which may provide useful data on the material in and around the proposed turning basin. These borings may be seen in Appendix A (pg. 6).

GBA collected grab samples of the bottom surface material while performing the initial single beam hydrographic survey of areas of interest surrounding Wallops Flight Facility. The grab samples closest to the proposed access channel were determined to be predominantly sand, while material from more distant sampling sites included silty sand and silt. Note that the surface grab samples represent the surface layers of channel material and material characteristics can vary with depth at a location.

Silty sand is used as an approximation for the material consistency of the recommended dredging areas. Material is expected to vary across the dredging areas, with higher sand content near the inlet and higher silt and organic content close to wetlands.

While the grab samples provide information for a preliminary dredging assessment, more detailed geotechnical work will be required to effectively progress to the feasibility and design phases for dredging. A proposed scope of work for initial geotechnical investigations was submitted to VCSFA in September 2019, and examples of proposed boring locations are provided in Appendix A (pg. 2-4):

Subtask 1.2 Preliminary Small Vessel Approach Channel and Basin Layout

GBA performed a preliminary engineering assessment based on a review of the range of VCSFA small vessel dimensions and operational needs required to develop a preliminary layout for the Small Vessel Channel and Basin. A variety of shallow draft (2 to 4 feet) manned and unmanned vessels will be serviced by the port. The major navigational service, for the initial phase of the project, will be a tug and barge configuration of an approximate 150 x 40 foot deck barge propelled by a coastwise tug boat requiring approximately 8 ft. of draft.

The small vessel approach channel will interface with the Chincoteague Inlet Federal Channel and the Bogues Bay Connecting Waterways. The engineering assessment determined that the US Army Corps of Engineers (Corps) is authorized to maintain Chincoteague Inlet to a depth of 12 ft. The Corps is also authorized to maintain the Bogues Bay Connecting Waterway Channel although our research did not indicate any records of past dredging in the connecting waterway. The Corps maintains the Chincoteague Inlet Bar Channel to a depth of 12 ft.; however, the Corps only maintains the interior channel to a depth of 9 ft. It seems that this decision is predominantly driven by budgetary constraints. The Corps faces a continuing challenge obtaining funds for dredging minor channels such as Chincoteague Inlet.

The channel evaluated in this engineering assessment has been selected at a depth of 12 ft. with a width of 100 ft. This channel is adequate for a tug and barge operation required for servicing the facility and the 100-foot width is consistent with the dimensions of the Federal Channel. The surveys conducted in January 2019 and used for this assessment indicate that there is sufficient water depth in the Federal Channel for a 12 ft. channel; however, discussions with the Corps will need to address any future maintenance dredging that may be required in the interior sections of the Chincoteague Channel that are presently only maintained to a depth of 9 ft. in the event of any shoaling.

The 12 ft. channel selected for this evaluation is a suitable solution to the phased approach for this project in order to be prepared for future expansion of the facility to allow for larger vessels. However, in the short term, a shallower draft channel may be prudent if the viability of the larger scale port seems unlikely. The 12 ft. channel is used for the calculation of the budgetary dredging and construction costs as well as for the basis of the scope of work for the Environmental Assessment.

The width of the channel can be adjusted as the project design matures and more information is determined about the possible future port expansion as well as the exact vessel dimensions that will service the facility. It is anticipated that these details will be addressed as the project moves toward final design and detailed construction cost estimates are prepared.

For the purpose of this preliminary layout, GBA evaluated an access channel from the USACE Chincoteague Inlet Channel to the proposed pier. The channel layout includes a turning basin at the end of the pier with a 200 ft. radius.

The proposed channel extends through and around Gunboat Point, turning south and intercepting the USACE designated Chincoteague Inlet Channel. An overview of this channel can be seen in Appendix A (pg. 1). This channel path was chosen to minimize the dredging necessary while maintaining a depth consistent with the Intermodal Port's intended uses. Soundings for the existing conditions throughout the proposed channel can be seen in Appendix A (pg. 2-4).

Figure 1 – Proposed Channel

During future design efforts two alternative pier designs will be assessed. The two alternative piers presented in Figure 2 are 620 ft. and 1,260 ft. The longer pier length would reach into existing deeper water and remove or significantly reduce the initial need for dredging a turning basin. This pier layout is shown in Appendix A (pg. 2).

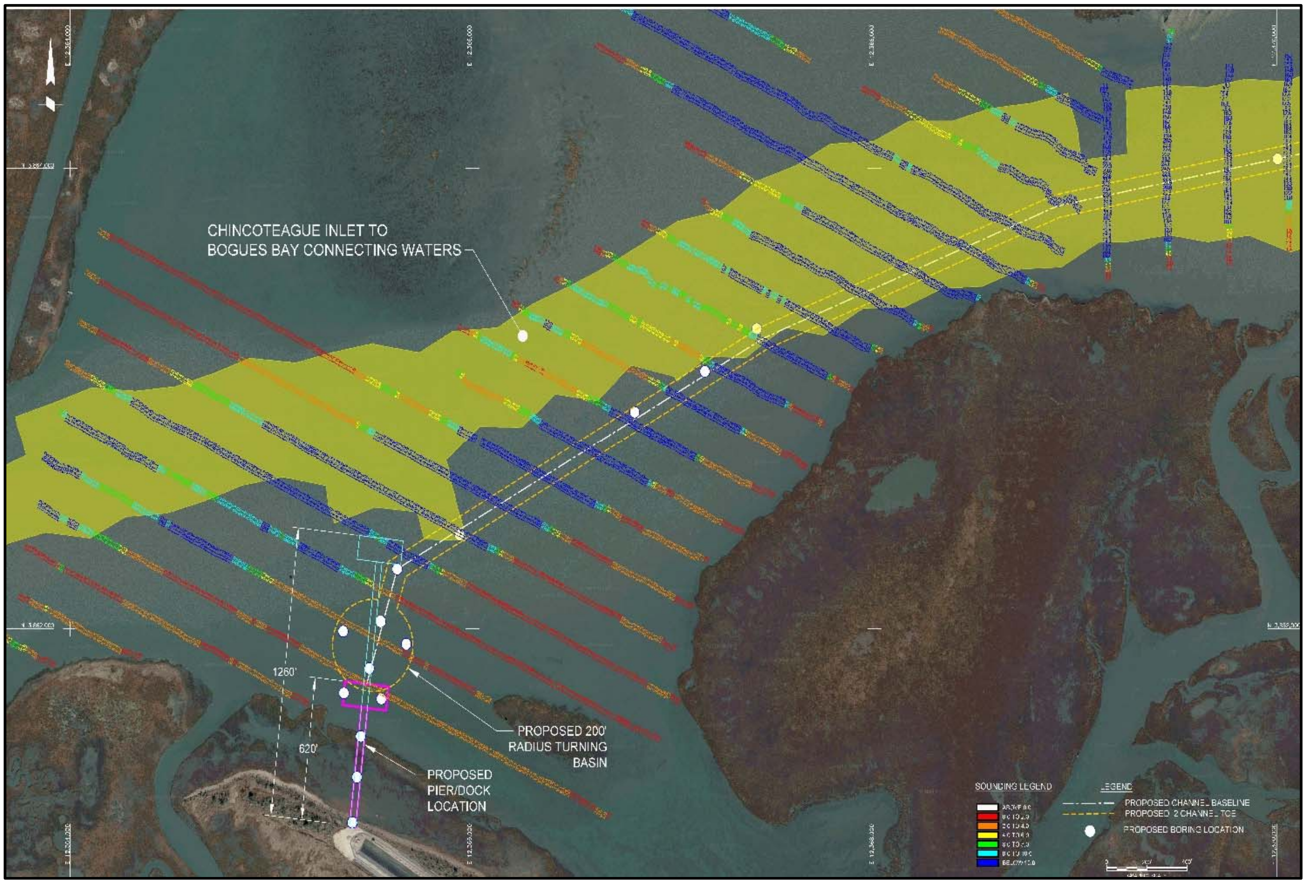


Figure 2 – Pier Layout

The preliminary layout of the access channel follows a similar route to the unmaintained, USACE designated Chincoteague Inlet to Bogues Bay Connecting Waters, shown in Appendix A (pg. 2-5). Furthermore, where the 12 ft. proposed channel ties into the Chincoteague Inlet Channel, the federal channel has only been maintained in recent years to 9 ft.; however, the channel is authorized to 12 ft. USACE surveys show that this channel currently exceeds its authorized depth at the intersection with the proposed channel. Chincoteague Outer/Bar Channel, which feeds into the south end of Chincoteague Inlet Channel, is maintained to 12 ft., but currently exceeds its authorized depth.

Note: Any preliminary channel path is tentative. While existing conditions favor the current baseline, hydrodynamic modelling may reveal more advantageous alignments to minimize long term maintenance dredging.

It is extremely important that the sedimentation for various channel alignments and the existing Chincoteague Inlet Channel be evaluated for typical seasonal/tidal movement, as well as for major storm events. The modeling that will be performed as part of the Environmental Assessment should evaluate expected sedimentation for the channel and pier length configurations presented as design alternatives in the 30% design. The results of this modeling will influence the final design.

Subtask 1.3 Dredge Quantity Calculations

GBA performed single beam hydrographic surveys in the area surrounding Wallops Island on January 15-18, 2019, using an ODOM CV-200 echosounder. Soundings were then used to calculate the depth of material above the proposed template depths of 12 ft. and 18 ft. and the area which this material covered. The dredging volumes are provided in the table below.

TABLE 1:

Channel Area	12 ft. Template	18 ft. Template
200 ft. Radius Turning Basin	64,007 CY	104,928 CY
100 ft. Wide Access Channel	126,895 CY	413,016 CY
Total Volume:	190,902 CY	517,944 CY

A survey for the required dredging to achieve the 12 ft. template is included in Appendix A (pg. 5).

Figure 3 – Proposed Alignment of Small Vessel Channel

Subtask 1.4 Identify Three (3) Potential Dredged Material Placement Locations

GBA assessed the available options for dredged material placement near Wallops Island and identified three potential placement sites, shown in the table below. "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 access channel, in statute miles. "Pipe distance" refers to the length of pipe required to reach the placement site from the centroid of dredging *or* from the anchorage for a vessel loaded with dredged material. Detail for each site, as well as relative distance to the proposed dredging location, is shown in Appendix B. Note there is the possibility of beneficial use of the sandy material on local shorelines while transporting fine grained material to the placement options once the material characteristics are better known. GBA has identified the following three placement locations for evaluation purposes and this report does not address any possible beneficial use locations.

Figure 4 – Material Placement Sites

TABLE 2: Dredged Material Placement Locations

Site	Description	Sail Distance from Basin	Pipe Distance from Basin	Sail Distance from Channel	Pipeline Distance from Channel
Wallops Open Ocean Dredge Material Placement Area	Open water placement site, closer than Lewis Creek or Norfolk Ocean disposal sites	6.1 miles	--	4.4 miles	--
MARS Flood Protection Zone	Reuse of material for flood mitigation through upland placement at site identified by VCSFA team members	--	2,800 ft.	0.0 miles	12,040 ft.
Greenbackville Dredged Material Containment Facility	Upland DMCF run by USACE, requires both navigation of Chincoteague Channel and pumping on location	11.3 miles	--	9.5 miles	650 ft.

The geotechnical investigation and associated physical and chemical laboratory analysis of the sediment samples will be the determining factor for the viability of the placement options for the dredged material. The sediment characterization is a key component of the Environmental Assessment and Tier III Elutriate, Bioassay and Bioaccumulation testing will need to be performed if open water placement for the dredged material is being considered. GBA has identified three potential open water placement sites and developed dredging costs for one of these sites in this report.

The testing required for open water placement is costly and time consuming; however, open water placement is typically the lowest cost alternative for dredging projects. This detail will be a focus during the pre-permit application discussions with stakeholders and a key factor in developing the overall project budget.

Subtask 1.5 Develop Budgetary Dredging Cost Estimates

TABLE 3: Summary of Budgetary Dredging Costs for Three Placement Alternatives:

Cost Option	Description	Equipment Type	Placement Method	Mob. & Demob. Lump Sum Amount	Dredging Qty. (Cy)	Dredging Unit Price	Dredging Amount	Contingent	Total Amount
1	**Wallops Open Ocean Dredged Material Placement Area**	Mechanical Dredge	Bottom Dump	$1,100,000	190,000	$13.50	$2,565,000	$300,000	$3,965,000
2	**Flood Protection/Upland Placement on MARS Site**	Cutter Suction Dredge	Direct Pump	$2,250,000	190,000	$7.50	$1,425,000	$1,000,000	$4,675,000
3	**Greenbackville Dredge Material Containment Facility**	Mechanical	Hydraulic Unloader	$2,500,000	190,000	$26.00	$4,940,000	$500,000	$7,940,000

Option 1: Wallops Open Ocean Dredge Material Placement Area

GBA identified three possible Open Water Placement Areas in the vicinity of the site. For the purpose of this preliminary analysis, we have evaluated the site that is located just offshore of Wallops Island with a transportation distance of the dredged material of approximately 4.4 miles (3.8 nautical miles). The other Wallops Open Water Placement Area is located inside Chincoteague Inlet and slightly farther away from the project site. A third open water location is the Norfolk Open Water Dredged Material Site is approximately 50 miles from the site and has not been considered in this preliminary cost analysis due to the long distance from the project location.

The Open Water placement options present the lowest cost dredging option and also allows 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.

As mentioned in Subtask 1.4, there will be permitting challenges and associated costs regarding the determination of the suitability of dredged material for open water placement that must be considered. Additionally, these open water placement locations are controlled by the US Army Corps of Engineers (Corps) and permission will need to be granted for the use of these sites. The possibility of this permission should be a priority in the early stages of stakeholder involvement and the results of this early engagement can influence the Environmental Assessment budget as it pertains to sediment testing. The Corps is mandated to explore the beneficial reuse of dredged material wherever possible and it is for this reason that the other placement alternatives may be selected.

Option 2: Flood Protection/Upland Placement on MARS Site

The second possible dredged material placement option evaluated in this report is the beneficial reuse of material for flood mitigation through upland placement in low lying areas on the MARS site. Specifically, there are low lying areas in the vicinity of the culvert crossing the main access road to the runway. GBA has evaluated this cost option on the basis of having a cutter suction dredge pump the material into this area. This option should be addressed during the Environmental Assessment and will require developing containment measures for the dredged material in the form of containment dikes constructed from on-site (or off-site material) 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.

The budgetary cost estimate presented for this option is based on using the low-cost method of using on-site material for containing the dredged material and constructing swales or channels for channeling the effluent (return water) into the surrounding waters. These considerations should be presented and evaluated during the early stages of stakeholder involvement and permitting.

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. Each of these methods has additional costs above the cost presented for this option; however, these methods may present the best practice for obtaining the permit and provide the most viable solution. Additionally, clean sand may be used beneficially on eroding shoreline.

Option 3: Greenbackville Dredged Material Containment Facility

The third dredged material placement option evaluated is the use of the upland Dredged Material Containment Facility (DMCF) owned and managed by the US Army Corps of Engineers (Corps). The Corps places material dredged from the upper reaches of the Chincoteague Channel into this DMCF and the Corps recently repaired and upgraded the weir structure for controlling the effluent from this facility.

This is the highest cost alternative evaluated because this method will require using a mechanical dredge to load the dredged material removed from the access channel into barges. These barges will then be towed a distance of 11.3 miles (9.8 nautical miles) to the DMCF. A specialized hydraulic unloader will be required to hydraulically unload the dredged material from the transport barges and pump the material into the DMCF. This method requires a considerable amount of equipment for the process and generates the lowest production rates which drives the higher relative cost.

Another potential cost factor associated with this alternative, that has not been included in the budgetary cost estimate for this option, is that the Corps can apply a disposal or "tipping" fee for the use of their facilities. This is another factor that should be discussed during the early stages of the stakeholder process and the VCSFA should leverage their state and federal affiliations in these discussions. It seems likely to receive good overall Corps support for this project as it increases the use of Chincoteague Inlet and Channel and this additional use should provide value to the Corps when seeking maintenance dredging funding for the Chincoteague Channel, which is drastically underfunded.

SUMMARY:

GBA has identified several alternatives for dredged material placement. Each alternative will need to be considered in the scope of the Environmental Assessment and the feedback from the initial meetings with the regulatory agencies and stakeholders will influence the final dredged material placement location decision.

Future studies, including hydrodynamic and morphodynamic modeling associated with various alternative channel geometries and alignments and pier lengths will help define the optimum channel location. Future alternatives analysis will consider the following: environmental impacts, initial dredging costs, maintenance dredging costs, pier costs and other study elements associated with the Environmental Assessment.

At this stage, it seems appropriate to apply the budgetary dredging cost estimate for Option 2, Flood Protection/Upland Placement on MARS Site in the amount of **$4,675,000** million as a planning budget for the dredging cost.

ATTACHMENT 5: EFH MAPPER AND SPECIES LIST

EFH Data Notice: Essential Fish Habitat (EFH) is defined by textual descriptions contained in the fishery management plans developed by the regional Fishery Management Councils. In most cases mapping data can not fully represent the complexity of the habitats that make up EFH. This report should be used for general interest queries only and should not be interpreted as a definitive evaluation of EFH at this location. A location-specific evaluation of EFH for any official purposes must be performed by a regional expert. Please refer to the following links for the appropriate regional resources.

Greater Atlantic Regional Office
Atlantic Highly Migratory Species Management Division

Query Results

Degrees, Minutes, Seconds: Latitude = 37º53'26" N, Longitude = 76º33'31" W
Decimal Degrees: Latitude = 37.89, Longitude = -75.44

The query location intersects with spatial data representing EFH and/or HAPCs for the following species/management units.

*** W A R N I N G ***

Please note under "Life Stage(s) Found at Location" the category "ALL" indicates that all life stages of that species share the same map and are designated at the queried location.

EFH

Show	Link	Data Caveats	Species/Management Unit	Lifestage(s) Found at Location	Management Council	FMP
			Atlantic Herring	Adult	New England	Amendment 3 to the Atlantic Herring FMP
			Windowpane Flounder	Adult	New England	Amendment 14 to the Northeast Multispecies FMP
			Winter Skate	Adult Juvenile	New England	Amendment 2 to the Northeast Skate Complex FMP
			Clearnose Skate	Adult Juvenile	New England	Amendment 2 to the Northeast Skate Complex FMP
			Sandbar Shark	Juvenile Neonate	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
			Smoothhound Shark Complex (Atlantic Stock)	ALL	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
			Sand Tiger Shark	Neonate/Juvenile Adult	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
			Bluefish	Adult Juvenile	Mid-Atlantic	Bluefish
			Atlantic Butterfish	Adult Juvenile	Mid-Atlantic	Atlantic Mackerel, Squid,& Butterfish Amendment 11
			Summer Flounder	Juvenile Adult	Mid-Atlantic	Summer Flounder, Scup, Black Sea Bass
			Black Sea Bass	Juvenile Adult	Mid-Atlantic	Summer Flounder, Scup, Black Sea Bass

HAPCs

Show	Link	Data Caveats	HAPC Name	Management Council
			Summer Flounder (Mid Atlantic)	MAFMC

EFH Areas Protected from Fishing

No EFH Areas Protected from Fishing (EFHA) were identified at the report location.

Spatial data does not currently exist for all the managed species in this area. The following is a list of species or management units for which there is no spatial data. **For links to all EFH text descriptions see the complete data inventory: open data inventory -->**
Mid-Atlantic Council HAPCs, No spatial data for summer flounder SAV HAPC.

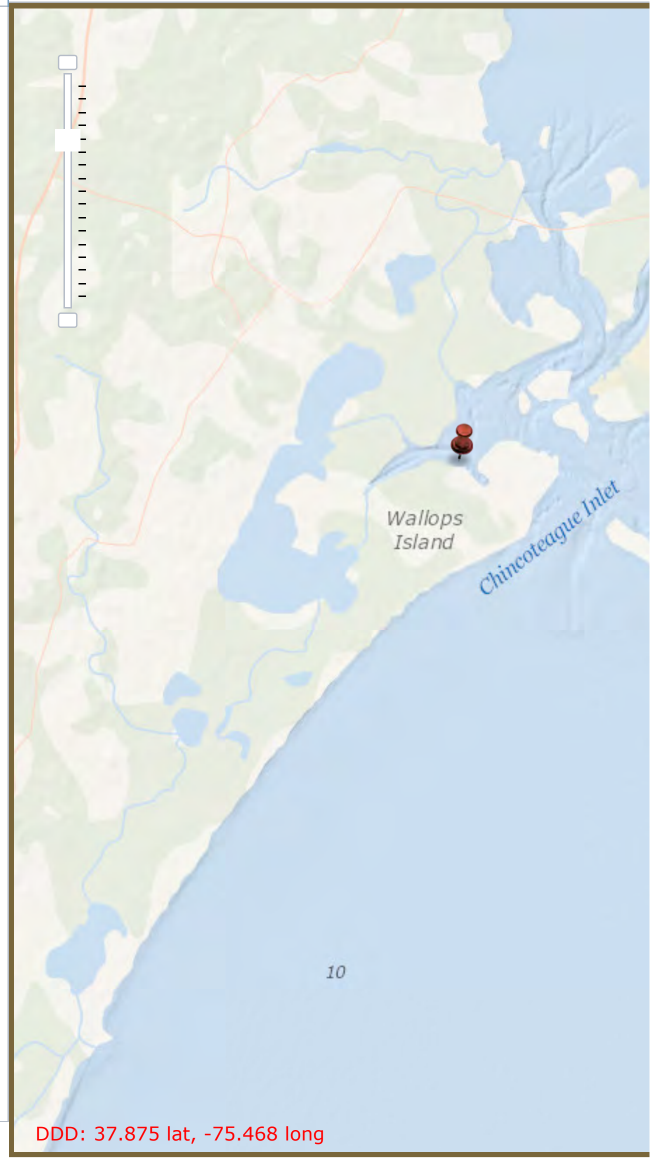
EFH View Tool | Data Query Tool

location.

EFH

Show	Link	Data Caveats	Species/Management Unit	Lifestage(s) Found at Location	Management Council	FM
			Atlantic Herring	Adult	New England	Amend 3 to Atlar Herring
			Windowpane Flounder	Adult	New England	Amend 14 to North Multisp FM
			Winter Skate	Adult Juvenile	New England	Amend 2 to North Ska Comp FM
			Clearnose Skate	Adult Juvenile	New England	Amend 2 to North Ska Comp FM
			Sandbar Shark	Juvenile Neonate	Secretarial	Amend 10 to 200 Consoli HMS F EFI
			Smoothhound Shark Complex (Atlantic Stock)	ALL	Secretarial	Amend 10 to 200 Consoli HMS F EFI

Zoom: Extent: Location Query:



ATTACHMENT 6: BENTHIC COMMUNITY ASSESSMENT

AECOM Imagine it. Delivered.

NASA Wallops

Benthic Infauna Community Assessment

February 14, 2021

Quality information

Prepared by	Checked by	Verified by	Approved by
Darron Kreigel	Pamela Neubert	Erika Grace	Bobbie Hurley

Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	2/14/2021	Review of Original	Pamela Neubert	Pamela Neubet	Vice President

Distribution List

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1. Introduction

A benthic macrofaunal survey was performed at a proposed project location on Wallops Island to construct a new runway for the U.S. National Aeronautical and Space Administration (NASA). This study was performed to determine existing conditions of benthic community structure in an area proposed to be dredged. This study provides documentation for benthic infaunal abundance, species richness and diversity. Benthic infaunal organisms have been documented as providing prey for fish and invertebrate species and can be used to infer sediment and water quality. Benthic samples were obtained in the area of potential effects (APE) for the proposed Wallops Flight Facility (WFF) intermodal barge service pier (the pier). The APE is defined as the area delineated within the 5280 foot (ft) by 300 ft. (1609.3 meter [m] by 91.4 m), pier construction corridor. As part of the proposed project, there will also be a geophysical and archeological assessment, however this report presents results from the benthic infaunal studies, only. The geophysical study will assess approximately 36.3 ac. (14.7 ha) and consist of approximately 7 linear miles (11.3 kilometers) of survey transects spaced at 50-ft. (15.2-m) intervals with event marks spaced every 100 ft. (30.48 m) collected in the State Plane Virginia South projection using the North American Datum 1983 (NAD 83) coordinate system. In addition, transects will be set and surveyed using the same geophysical instruments in a grid spaced 50-ft. (15.2 m) for an alternative pier location in proximity to the UAS airstrip. Benthic samples were obtained during the geophysical investigation.

2. Survey Methodology

AECOM performed a benthic macrofaunal survey within the proposed project area (Figure 2.1). AECOM's study collected six (6) samples from locations within representative areas where the proposed project plans to alter the habitat, either by filling and/or dredging. Samples were obtained from subtidal areas adjacent to wetlands and beachfront habitat.

Bottom samples were collected using a 0.04 m^2 ponar grab. Upon grab retrieval, the entire sample was fixed in formalin buffered with sodium borate (Borax) and sent to the AECOM benthic ecology laboratory located in Pocasset, MA without sieving. Upon receipt at the AECOM laboratory, the samples were sieved on a 500 micron (µm) mesh screen and transferred to a solution of 70% ethanol.

Benthic macrofaunal samples were stained in the AECOM laboratory using vital dye (rose bengal) following transfer of material from formalin to ethanol and subsequently sorted under dissecting microscopes. Identifications were performed by AECOM's in-house benthic taxonomists to the lowest practical taxonomic level. The following metrics were analyzed: abundance of organisms by Family, and density of individuals. Primer E statistical software package was used to calculate univariate metrics including species richness, abundance, Pileou's Evenness (J'), and Shannon-Wiener diversity ($\log_e$) (H').

Community Metrics

Abundance: The number of individuals observed within a sample collected from a station.

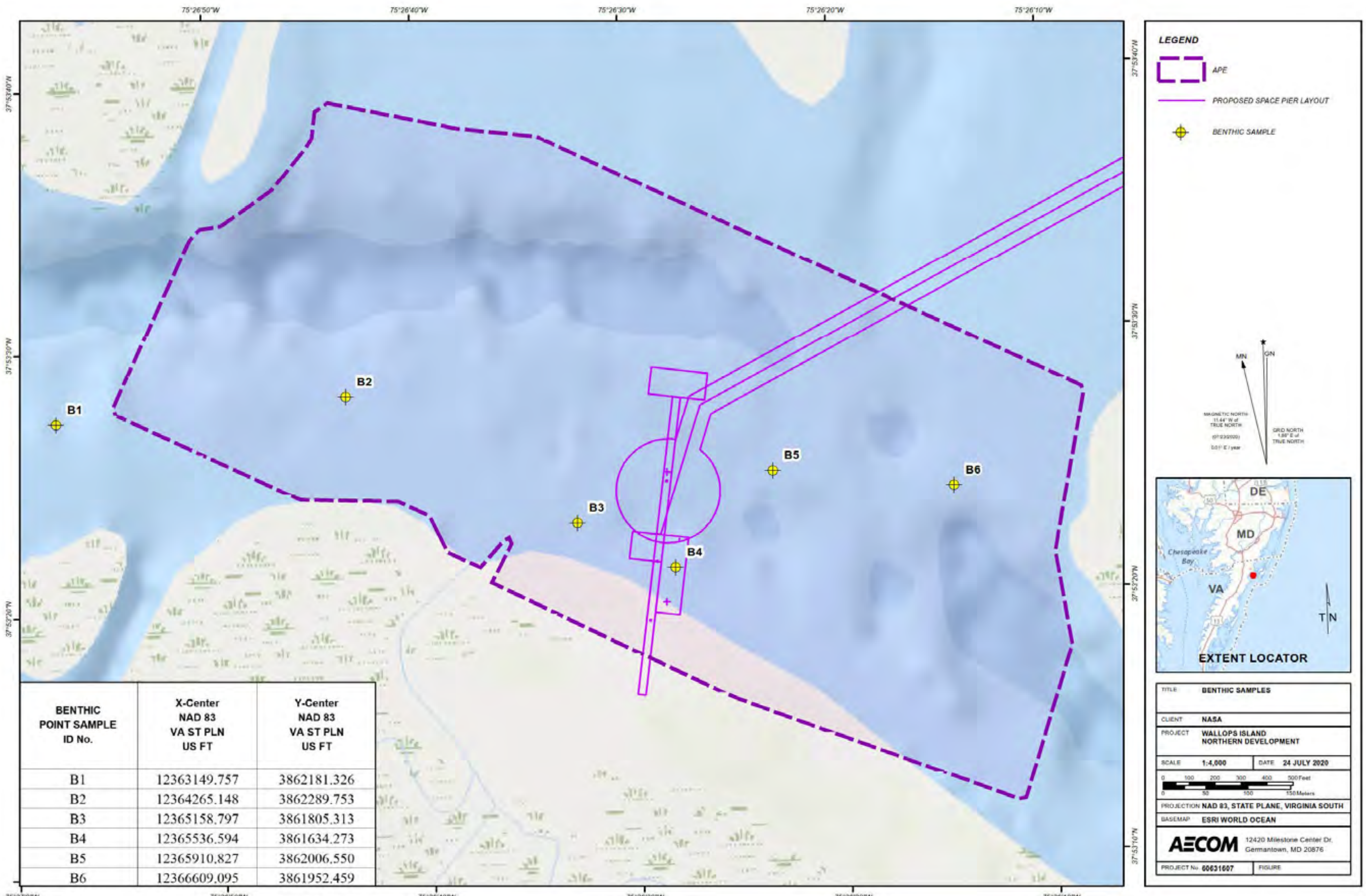
Density: The extrapolated number of individuals per square meter

Species richness: The number of species in a sample collected from a station.

Pileou's Evenness (J'): The equality of species distribution within a collected sample. Evenness is calculated between 0 and 1. Stations with low evenness values (closer to 0) share few species and are considered to have higher diversity. Stations with high evenness values (closer to 1) share many similar taxa and are considered to have lower diversity.

Shannon-Weiner Diversity: The Shannon-Wiener diversity index (H) is a measure of diversity that combines species richness (the number of species in a given area) and their relative abundances.

Figure 2-1 Sample locations



BENTHIC POINT SAMPLE ID No.	X-Center NAD 83 VA ST PLN US FT	Y-Center NAD 83 VA ST PLN US FT
B1	12363149.757	3862181.326
B2	12364265.148	3862289.753
B3	12365158.797	3861805.313
B4	12365536.594	3861634.273
B5	12365910.827	3862006.550
B6	12366609.095	3861952.459

3. Results

Infaunal organisims identified from the six benthic samples collected were representative of typical estuarine habitat. The six (6) benthic samples had a total of 540 individuals from thirty four (34) different taxonomic groups. Some individual organisms were readily identifiable to the species level while others remained at a higher classification to expedite sample analysis while balancing level of taxonomic effort. Annelida (Polychaeta) were the dominant taxonomic group and comprised 55% of the identified individuals. Bivalves were the second most abundant and comprised 26% of the identified individuals. The three polychaete Families Capitellidae, Spionidae Cirratulidae and one mollusk Family Tellinidae were consistently present within the six samples.

Abundances varied among the stations with the lowest abundance from Station 3 with 31 individuals to the highest abundance of 232 individuals from Station 2. The average abundance was 94 individuals per station (Table 3.1) The density of organisms was calculated based on the sampled area of the grab with the lowest density 3,823 individuals/m^2 (Station 2) to 28,608 individuals/m^2 (Station 2). The mean density from the six (6) stations combined was 11,612 individuals/m^2 (table 3.2), which is typical for having high abundances but lower diversity due to the extreme and harsh conditions common to intertidal estuarine habitat. A photo log of the grab surface from each of the 6 samples collected is presented in Appendix A. Table 3-3 presents univariate diversity metrics calculated for each station. The stations sampled had similar evenness and Shannon-Wiener diversity calculations. Diversity was uniformly low across the locations, which is typical for highly dynamic estuarine habitat that is characterized by extreme changes in salinity, temperature, and turbidity temporally and spatially. The organisms identified were largely opportunistic species such as spionid and capitellid polychaetes that recolonize disturbed habitats rapidly.

Table 3-1 Abundance of infaunal organisms per station.

Sum of Count	Column Labels						
Row Labels	1	2	3	4	5	6	Grand Total
Annelida	**49**	**132**	**21**	**68**	**16**	**61**	**347**
Capitellidae	7	21	8	20	3	29	88
Cirratulidae	21	13	1	13	2	6	56
Dorvilleidae				1			1
Glyceridae	1				1		2
Lumbrineridae	2			5	1		8
Maldanidae	1			2			3
Nephtyidae						1	1
Orbiniidae				1	2	1	4
Paraonidae				1			1
Phyllodocidae				1	1	5	7
Spionidae	12	82	12	15	4	10	135
Syllidae		5					5
Oligochaeta	5	11		9	2	9	36
Arthropoda	**5**	**8**	**3**	**19**		**14**	**49**
Ampeliscidae	3	2				6	11
Corophiidae			1	14			15
Gammaridae						7	7
Idoteidae	1	5	1			1	8
Melitidae			1	5			6
Mysidae		1					1
Phoxichilidiidae	1						1
Hemichordata		**1**					**1**
Mollusca	**4**	**90**	**4**	**5**	**36**	**23**	**162**
Pectinidae				1			1
Acteonidae		4					4
Arcidae					2		2
Bivalvia			1				1
Columbellidae		2					2
Mactridae						2	2
Nassariidae				2	2	2	6
Pyramidellidae		2					2
Solecurtidae	1	2				3	6
Tellinidae	3	80	2	2	32	16	135
Nudibranchia			1				1
Nemertea		**1**					**1**
Platyhelminthes			**1**		**1**	**1**	**3**
Sipuncula			**2**				**2**
Golfingiidae			2				2
Grand Total	**58**	**232**	**31**	**92**	**53**	**99**	**565**

Table 3-2 Density of infaunal organisms

Station	**1**	**2**	**3**	**4**	**5**	**6**	Average
Abundance of individuals	58	232	31	92	53	99	94
Density per meter^2	7152	28608	3823	11344	6535	12208	11612

Table 3-3. Diversity metrics

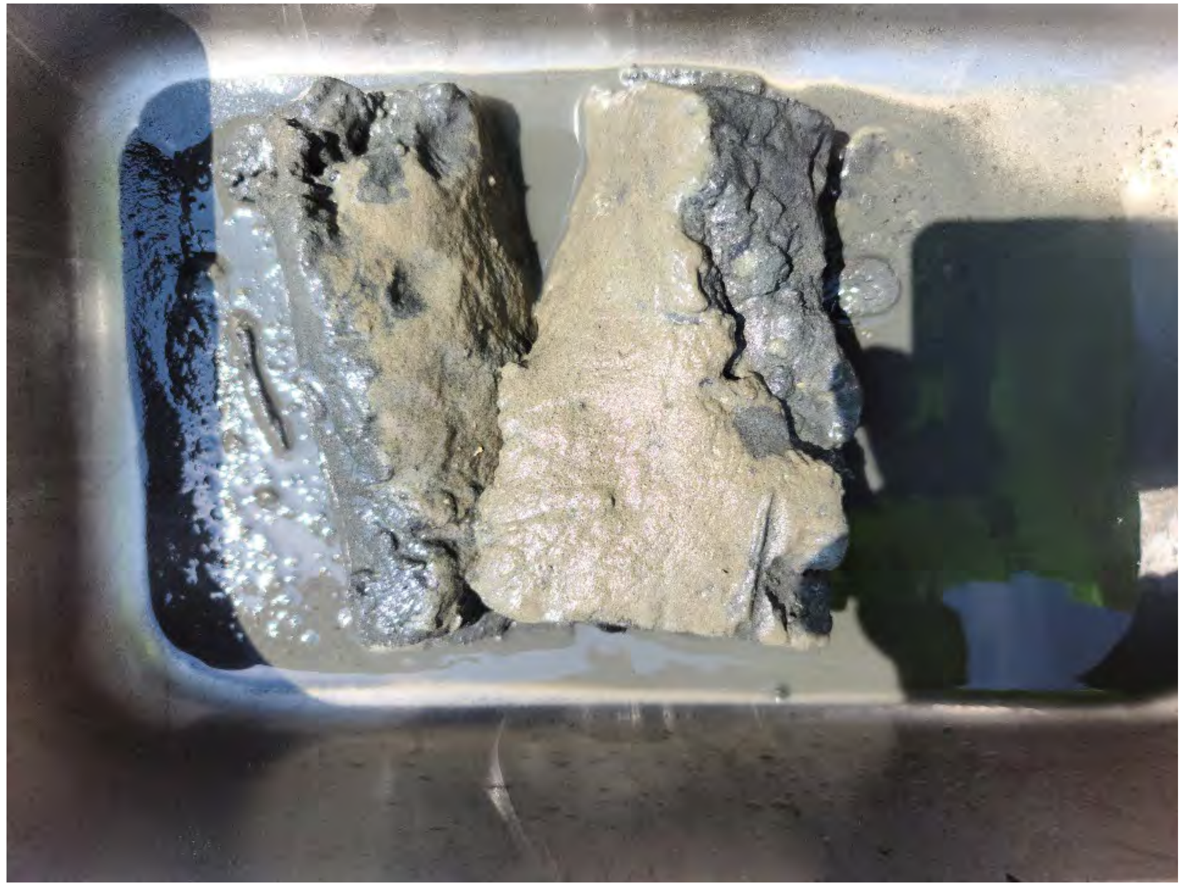
	Species Richness	**Abundance**	**Pileou's Evenness (J')**	**Shannon-Wiener Diversity (J')**
Station 1	12	56	0.77	1.92
Station 2	15	227	0.64	1.74
Station 3	10	29	0.78	1.79
Station 4	15	85	0.83	2.24
Station 5	12	50	0.66	1.64
Station 6	15	93	0.83	2.25

Taxa from groups at higher taxonomic level with likely more than one species, juveniles, and damaged individuals were not included in diversity calculations

4. Discussion

The majority of organisms in the benthic samples were deposit feeders that either sit with their anterior ends at the surface or make shallow head-down burrows into the sediment. These organisms are categorized as being highly opportunistic and have the ability to rapidly recolonize disturbed areas. There were omnivorous amphipods and filter feeding bivalves but fewer in abundance than the polychaete worms. These organisms consuming bacteria, detritus and nutrients in the sediment and can be prey for higher trophic levels but overall abundances of these organisms were low as was diversity, which is typical for estuarine and anthropogenically disturbed environments. The majority of the polychaetas identified were threadlike capitellids and small spionidae together they composed approximately 40% of the identified individuals but have a small, overall percentage of the biomass obtained at the time of sampling, therefore are not a substantial component of food. It is likely that opportunistic bottom grazing fish consume these organisms and subsequent to the temporary Project activities proposed, these same species will recolonize the area from the surrounding habitat. For example, more than one-third (39%) of the identified organisms from the six samples consisted of two (2) opportunistic species: 1. capitellids and 2. spionids (*Streblospio benedicti*). These two taxa 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. The six (6) 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 as a consequence of excess nitrogen from anthropogenic sources (eutrophication) as well as decaying salt marsh peat material. Impacts associated with the proposed Project will not significantly impact the benthic communities in Project vicinity as abundances and diversity of benthic infaunal organisms was low and dominated by opportunistic species that will rapidly recolonize habitat when the proposed Project has been completed. .

Appendix A Photo Log

Photograph: 1	**Date:** 07/21/2020	
Feature ID: Benthic 1		
Time: 11:44		
Description: Densely packed sand with some organic material **Sampling Equipment:** Petite ponar **Color:** Light gray top layer, darker gray below, suggesting a thin layer of oxidized sediment over a hypoxic or anoxic layer **Moisture:** Saturated **Benthic Fauna:** None observed **Odors:** Hydrogen sulfide suggesting hypoxia or anoxia at time of sampling.		

Photograph: 2

Date: 07/21/2020

Feature ID: Benthic 2

Time: 11:59

Description: Sand with organic material, less dense than Station 1 with higher water content.

Sampling Equipment: Petite ponar

Color: Gray at surface and to depth of sample collection suggesting anoxic or hypoxic sediments

Moisture: Saturated

Benthic Fauna: None observed

Odors: Hydrogen sulfide suggesting anoxic or hypoxic sediments

Photograph: 3	Date: 07/21/2020
Feature ID: Benthic 3	
Time: 11:19	

Description: Large amount of seaweed (assuming Gracillaria) present in sample; sand, less dense than sample 1, higher water content

Sampling Equipment: Petite ponar

Color: Gray at surface and to depth of sample collection suggesting anoxic or hypoxic sediments

Moisture: Saturated

Benthic Fauna: None observed

Odors: Hydrogen sulfide suggesting anoxic or hypoxic sediments

Photograph: 4	Date: 07/21/2020
Feature ID: Benthic 4	
Time: 11:15	

Description: Seaweed (assuming Gracillaria) present in sample; densely packed sand with organic material

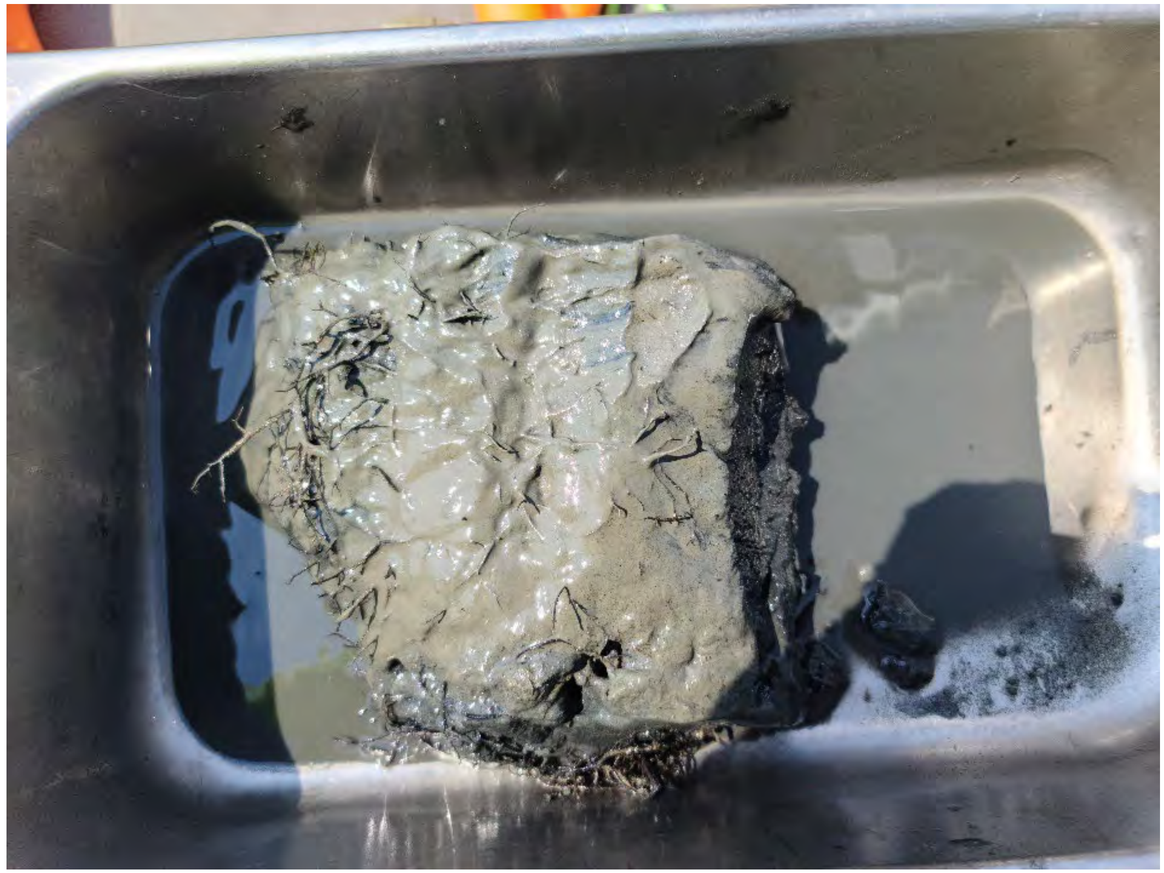
Sampling Equipment: Petite ponar

Color: Gray at surface and to depth of sample collection suggesting anoxic or hypoxic sediments

Moisture: Saturated

Benthic Fauna: None observed

Odors: Hydrogen sulfide suggesting anoxic or hypoxic sediments



Photograph: 5	**Date:** 07/21/2020	
Feature ID: Benthic 5		
Time: 11:05		
Description: Seaweed (assuming *Gracillaria* and *Ulva*) present in sample; densely packed sand with organic material **Sampling Equipment:** Petite ponar **Color:** Gray at surface and to depth of sample collection suggesting anoxic or hypoxic sediments **Moisture:** Saturated **Benthic Fauna:** None observed **Odors:** Hydrogen sulfide suggesting anoxic or hypoxic sediments		

Photograph: 6	Date: 07/21/2020	
Feature ID: Benthic 6		
Time: 10:40		
Description: Seaweed (assuming Gracillaria) present in sample; densely packed sand with organic material **Sampling Equipment:** Petite ponar **Color:** Gray at surface and to depth of sample collection suggesting anoxic or hypoxic sediments **Moisture:** Saturated **Benthic Fauna:** None observed **Odors:** Hydrogen sulfide suggesting anoxic or hypoxic sediments		

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From:	Miller, Shari A. (WFF-2500) <shari.a.miller@nasa.gov>
Sent:	Wednesday, November 10, 2021 12:05 PM
To:	Karen.Greene@noaa.gov
Cc:	Nate Overby; Finio, Alan (MARAD); brian.c.denson@usace.army.mil; Brian Hopper (Brian.D.Hopper@noaa.gov); Finch, Kimberly (GSFC-2500); Meyer, T J (WFF-2500); David O'Brien (david.l.obrien@noaa.gov); Levine, Lori M. (GSFC-2500)
Subject:	Project Review Request, Wallops Island Northern Development, NASA WFF
Attachments:	NASA WFF_NorthDevelop - NOAA_EFH Consult Ltr_111021.pdf

Dear Ms. Greene:

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) propose to construct a pier for barge access and berthing and to dredge a vessel approach channel connecting to the Chincoteague Inlet Federal Channel. NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Essential Fish Habitat (EFH) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfil their requirements.

Based on the attached EFH assessment, NASA has determined that the effects of the Proposed Action on EFH would not be substantial. I certify that we have used the best scientific and commercial data available to complete this assessment and request your concurrence with this determination. If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Thank you.

Shari A. Miller
Center NEPA Manager &
Natural Resources Manager
NASA GSFC Wallops Flight Facility
Wallops Island, VA 23337
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"Remember there's no such thing as a small act of kindness. Every act creates a ripple with no logical end." —Scott Adams

National Aeronautics and Space Administration

Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337

Reply to Attn of: 250.W November 10, 2021

Ms. Karen Greene
Mid-Atlantic Field Office Supervisor and EFH Coordinator
Greater Atlantic Regional Fisheries Office
NOAA Fisheries
55 Great Republic Drive
Gloucester, MA 01930

Subject: Project Review Request, Wallops Island Northern Development, NASA Wallops Flight Facility, Accomack County, Virginia

Dear Ms. Greene:

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) propose to construct a pier for barge access and berthing and to dredge a vessel approach channel connecting to the Chincoteague Inlet Federal Channel (**Figures 1 and 2**). NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Essential Fish Habitat (EFH) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfil their requirements.

NASA is preparing an Environmental Assessment (EA) in compliance with NEPA to analyze the potential effects of the proposed action on the environment. The EA will be tiered from the May 2019 *NASA WFF Site-Wide Programmatic Environmental Impact Statement* (PEIS), in which NASA evaluated the environmental consequences of constructing and operating new facilities and infrastructure at WFF.

The purpose of this letter is to provide information about the proposed project and to request your concurrence with our determination regarding potential effects on EFH. NASA has evaluated the potential for the project to adversely affect EFH in accordance with the Magnuson-Stevens Fishery Conservation and Management Act (MSA). NASA used the Greater Atlantic Regional Fisheries Office EFH Assessment Worksheet to evaluate potentially affected EFH, and we are submitting our evaluation and findings for your review. The EFH Assessment Worksheet is provided in **Attachment 1**. We have determined that the impact of the Proposed Action on EFH would not be substantial and request an abbreviated EFH consultation.

Background

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 2019a). The M-95 Marine Highway Corridor 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 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 2019b).

VCSFA 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 STEM 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 launches to orbital trajectories. This led to the establishment of the Mid-Atlantic Regional Spaceport (MARS) which is owned and operated by VCSFA.

Development of a port and operations area to support the activities of NASA, WFF tenants, and MARS at the north end of Wallops Island was evaluated at a programmatic level of detail in the 2019 *Final Site-wide PEIS* (NASA 2019). NASA has several long-term tenants and customers that use the WFF research airport and Wallops Island launch range, its facilities, and airspace.

Description of the Proposed Action

Under the Proposed Action, the MARS Port, including a 1,305-ft fixed pier and turning basin, would be constructed adjacent to the UAS airstrip located at the north end of Wallops Island (**Figures 1 and 2**). 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 intermodal facility as part of the MARAD M-95 Marine Highway Corridor. Infrastructure (new upland facilities and improvements to the existing access road, airstrip, and utilities) would likewise be constructed or installed as part of the Proposed Action. Access road improvements would include widening of an existing culvert. Although shown for completeness in **Figure 2**, upland activities that would not affect essential fish habitat are not discussed further.

The Proposed Action would also include the dredging of a new and existing channel to enhance the vessel approach to the pier (**Figure 3**). The vessel approach channel, which interfaces with two Federal waterways, the Chincoteague Inlet Channel and the Chincoteague Inlet to Bogues Bay connecting waters would initially be used by a variety of shallow-draft, manned and unmanned vessels. Ultimately, the proposed channel would have a length of approximately 12,800 ft, a width of 100 ft, and a final depth of 12 ft below mean lower low water (MLLW). Components of the Proposed Action are further described below.

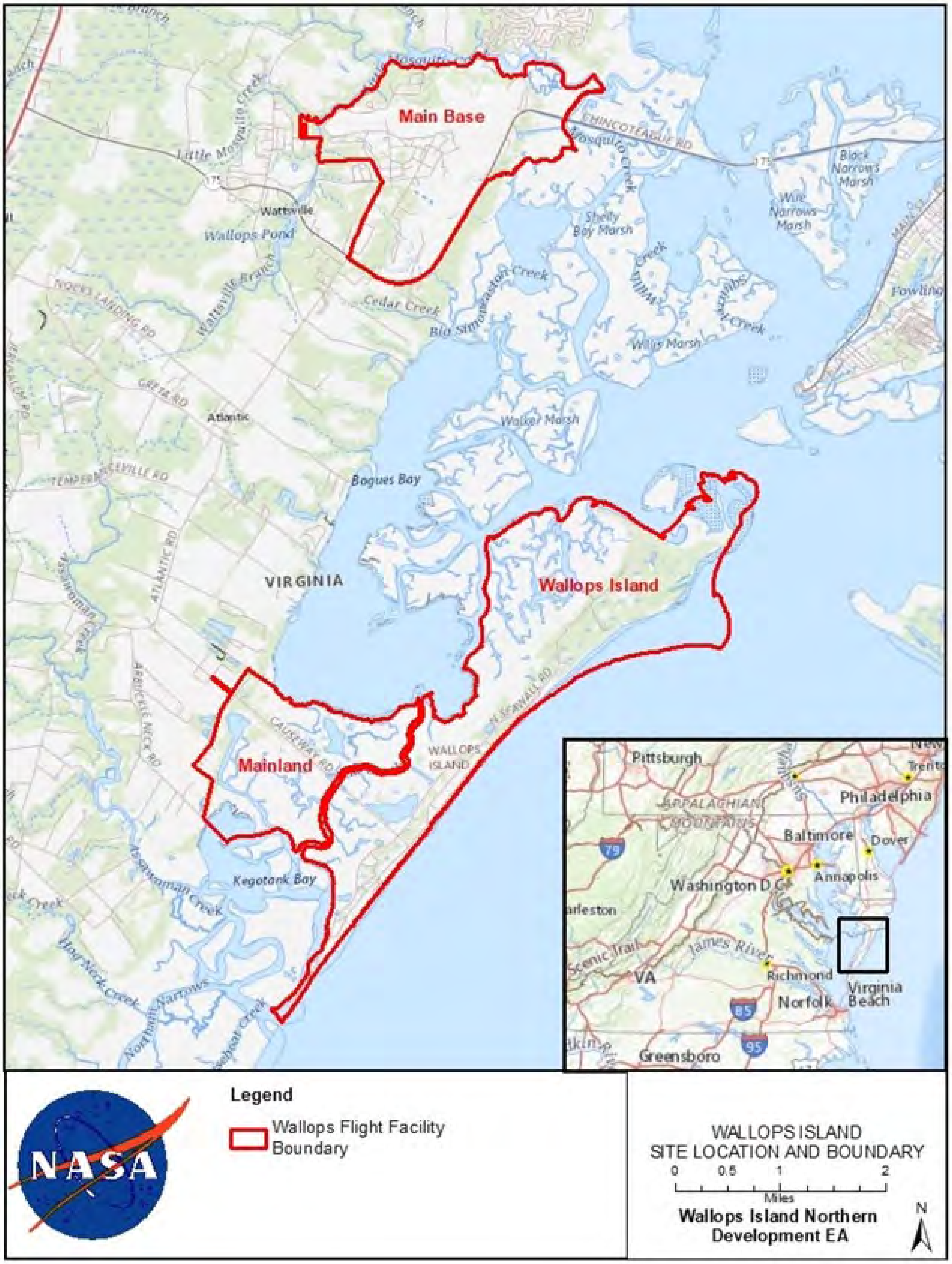

Figure 1. NASA WFF Location

Figure 2. Proposed MARS Port and Infrastructure Components

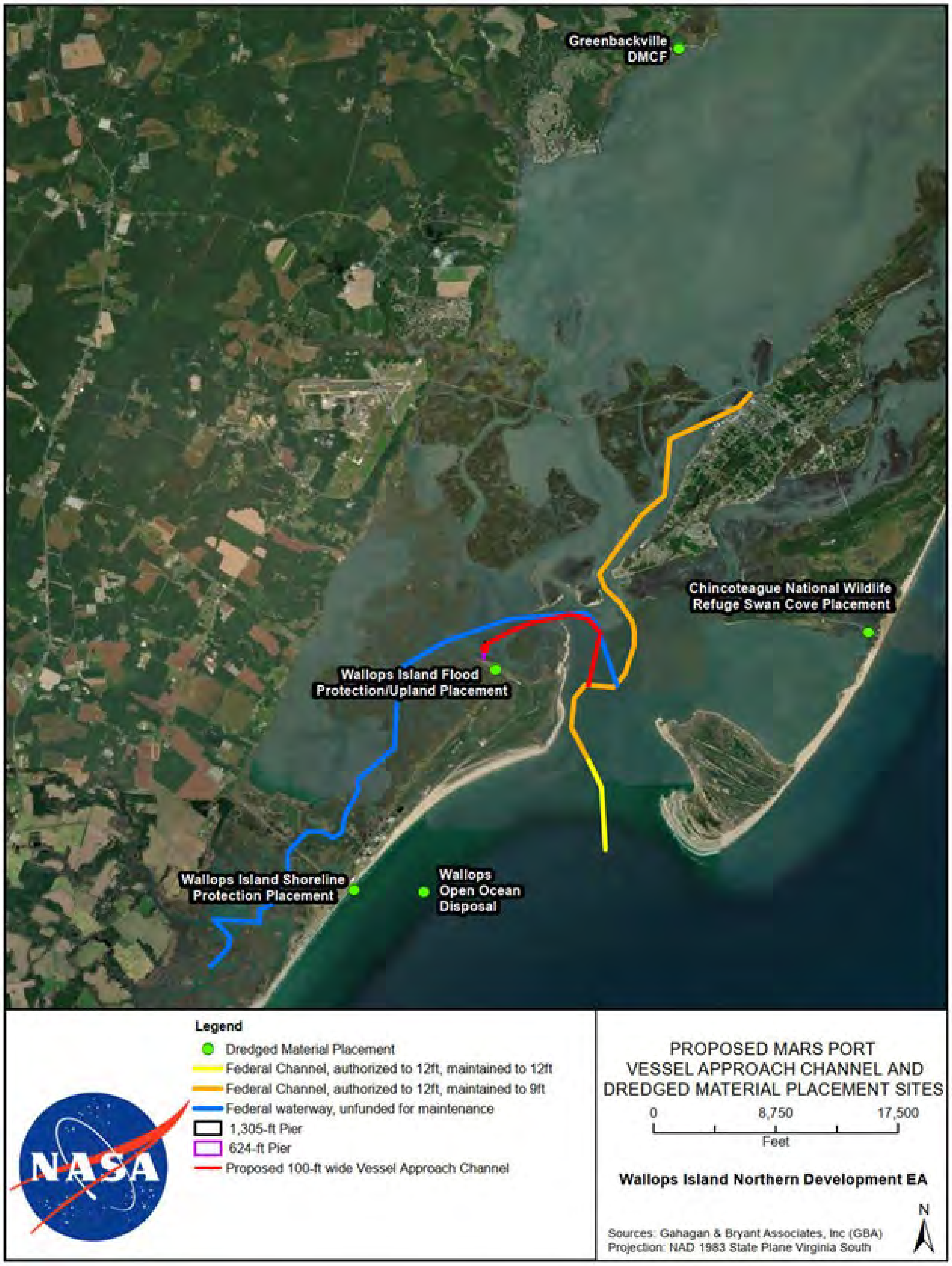

Figure 3. Proposed MARS Port Vessel Approach Channel and Dredged Material Placement Sites

Proposed Action In-Water Components

The MARS Port, including a 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. The MARS Port would provide a port and operations area along with associated capabilities for MARS, NASA WFF, and other customers. The MARS Port would also serve as a new part of the MARAD M-95 Marine Highway Corridor. Upland infrastructure (new facilities and improvements to the existing access road, airstrip, and utilities) would likewise be constructed and installed as part of the Proposed Action.

The Proposed Action would also include the dredging of an existing channel for enhanced vessel approach purposes. The vessel approach channel, which would interface with both the Chincoteague Inlet Federal Channel and the Bogues Bay connecting waterways, would be used by a variety of manned and unmanned vessels. It would be approximately 12,800 ft long, 100 ft wide, and would have a final depth of 12 ft below MLLW.

Construction of the Proposed Action would be carried out in three phases:

- **Phase 1** would be construction of a 624-ft fixed pier, a 200-ft-radius turning basin 9 ft deep below MLLW and dredging of the vessel approach channel to a final depth of 5 ft to 9 ft below MLLW (red outline in **Figure 4**). The area dredged would total approximately 34 ac. Additionally, a 130-ft long segment of the existing paved UAS Airstrip access road would be widened from 15 ft to 30 ft in conjunction with the widening of the culvert over which the road crosses a headwater drainage channel to Cow Gut.
- **Phase 2** would be construction of a 676-ft extension of the fixed pier to a total length of 1,305 ft and dredging of a 200-ft-radius turning basin (located at the end of the pier extension; shaded pink on **Figure 4**) to a final depth of 9 ft below MLLW. The area dredged would total approximately 4 ac.
- **Phase 3** of construction would be additional dredging of the turning basin and vessel approach channel to a final depth of 12 ft below MLLW, specifically the portion of the channel from the Phase 2 turning basin to where it meets the Chincoteague Inlet Federal Channel (shaded blue on **Figure 4**). The previously dredged area that would be dredged again to increase its depth would total approximately 33 ac.

The portion of the channel shown in pink on **Figure 4**, which connects the vessel approach channel to the Phase 2 turning basin, is naturally deeper than 9 feet 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 2022 and being completed by 2024, with subsequent phases occurring approximately 1 to 2 years after completion of the prior phase. Additional information about the proposed piers and other port components is provided in Chapter 2 of the Draft EA.

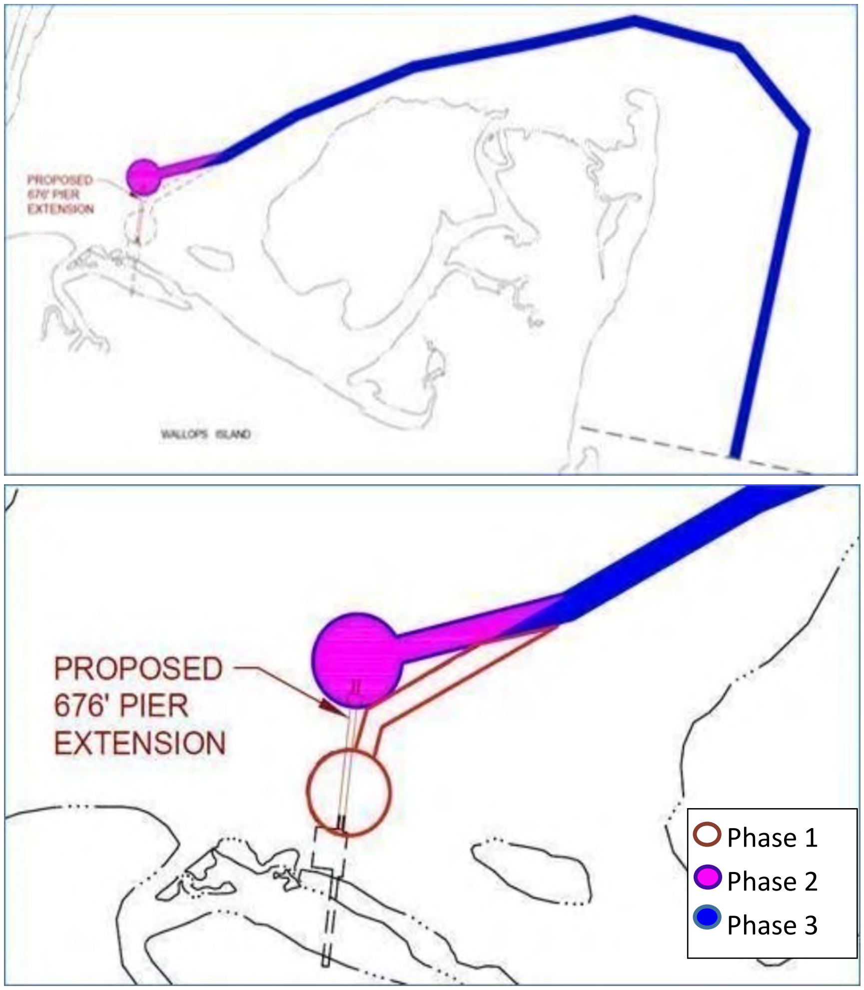

Figure 4. Diagram of Proposed Phased Construction

A variety of shallow-draft (2- to 4-ft), manned and unmanned vessels would be serviced by the port. The major navigational service would be a tug and barge configuration of an approximately 150-ft by 40-ft deck barge propelled by a tugboat requiring approximately 8 ft of draft. The vessel approach channel would intersect with the Chincoteague Inlet Federal Channel and the Bogues Bay connecting waterways (**Figure 3**). The proposed width of the approach channel, approximately 100 ft, is consistent with the dimensions of the Federal Channel. Estimated dredging volumes for the vessel approach channel and turning basin are provided in **Table 1**.

Table 1. Estimated Dredging Volumes

	Phase 1	Phase 2	Phase 3
Channel depth (depth below MLLW)	9 ft	9 ft	12 ft
Channel length	12,800 ft	11,800 ft	11,800 ft
Channel dredging volume	15,100 yd^3	0	34,600 yd^3
Turning basin dredging volume	40,500 yd^3	800 yd^3	3,200 yd^3
Total volume per phase	55,600 yd^3	800 yd^3	37,800 yd^3
		Total Volume (Phases 1–3):	**94,200 yd^3**

yd^3 = cubic yards

Five potential sites for the placement of dredged material are summarized in **Table 2** and shown on **Figure 3**. Currently, it is estimated that between 56,000 CY and 57,000 CY of material would be dredged during the initial dredging event. VCSFA intends to utilize Option 1, the Wallops Open Ocean Dredge Material Placement Area, as the initial dredge material placement site. When compared to Options 2 through 5, 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. The Open Ocean site is also the fastest path towards construction as it is already permitted by the USACE and has capacity for the proposed initial dredge material. While the Greenbackville DMCF (Option 3) is also already permitted by the USACE, it is not anticipated to have available capacity to handle the initial projected volume of material due to its expected use by USACE. Lastly, the dredged material is expected to be of similar physical and chemical characteristics as the material currently dredged from the Chincoteague Channel by the USACE. Dredged material placed within the Wallops Island nearshore zone is required to have the same physical characteristics (90%+ sand) as the natural bottom 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 compromised of approximately 95% sand and, therefore, would be suitable for the Open Ocean site.

For future maintenance dredging events, the Project may use Option 2, Wallops Island Flood Protection/Upland Placement. Keeping this as an option allows for future beneficial re-use of the dredge material on Wallops Island to provide resiliency to the MARS UAS Airfield. The cost of this option is higher as it would require additional studies, design, and construction to contain and shape the pumped discharge. Option 2 may also have impacts to the wetlands north of the UAS Airfield. Further analysis would be required for this impact and depending on the results, thin layer deposition or the use of geotubes could be required to hold the material. Lastly, the UAS Airfield is currently not permitted for material placement; the permitting process would require a longer timeframe than Option 1. If selected for placement during future maintenance dredging events, designs, impact analysis, and permitting would be required and would be performed at that time.

Table 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**	**Description**
1	Wallops Open Ocean Dredge Material Placement Area	Open water placement site, closer than Lewis Creek or Norfolk Ocean disposal sites	6.1 mi	--	4.4 mi	--	This area is located just offshore of Wallops Island with a transportation distance of the dredged material of approximately 4 nautical mi. Open water placement options typically present the lowest cost dredging option and allows 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
2	Wallops Island Flood Protection/ Upland Placement	Reuse of material for flood mitigation through upland placement at site identified by NASA	--	2,800 ft	--	12,040 ft	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 crossing 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.

Table 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**	**Description**
3	Greenbackville Dredged Material Containment Facility (DMCF)	Upland DMCF run by USACE, requires both navigation of Chincoteague Channel and pumping on location	11.3 mi	--	9.5 mi	650 ft	The third dredged material placement option identified is the use of the upland Dredged Material Containment Facility (DMCF) owned and managed by the USACE. The USACE places material dredged from the upper reaches of the Chincoteague Channel into this DMCF. This option, which would require the USACE to first verify capacity and permit use of this site, would utilize a mechanical dredge to load the dredged material removed from the approach channel into barges. These barges would then be towed approximately 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. However, according to USACE, this site has limited capacity for material and may not be suitable.
4	Wallops Island Shoreline Protection Placement	Reuse of material for shoreline protection and beach repair	7.5 mi	--	6 mi	--	This option would involve the beneficial reuse of clean, compatible sand from the dredged material to repair and protect areas of the shoreline within the Launch Range area on Wallops Island. If dredged material is 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 such as hurricanes and Nor'easters. 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 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.

Table 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**	**Description**
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)	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 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 under sized 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. Once pumped, USFWS will assume responsibility for sediment placement and is in the process of securing appropriate permits.

[1] Sail distance = 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 (statute miles)
[2] Pipe distance = the length of pipe required to reach the placement site from the centroid of dredging or from the anchorage for a vessel loaded with dredged material
DMCF = Dredged Material Containment Facility

Summary of Proposed Action Construction Activities

Construction of the Proposed Action would involve: (1) construction of the pier components that would make up the MARS Port, (2) dredging of the vessel approach channel, turning basin, and placement of dredged material, and (3) construction or improvement of the proposed onshore facilities and infrastructure.

The estimated timeframe for construction of the Proposed Action would have Phase 1 beginning in 2022 and being completed by 2024, with subsequent phases occurring approximately 1 to 2 years after completion of the prior phase. 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). With two crews (10 persons each), working 5 days per week (10-hour days), construction of the 624-ft long pier under Phase 1 would take approximately 12 months to complete and construction of the 676-ft long pier extension under Phase 2 (for a total pier length 1,305 ft) would take approximately 9.5 months to complete.

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, tugboat, vibratory pile hammer, diesel impact hammer, concrete truck, concrete pump truck, concrete vibrator, generator, welding machines, cutting torches, and various small tools.

Summary of Proposed Action Operational Activities

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 fencing around the Revolutionary War Earthworks. During summer months, a mosquito fogging service truck sprays the airfield once every 2 weeks. The pier structure would also require quarterly structural inspections.

Potential usage of the MARS Port facility during its operation is provided in **Table 3**.

Table 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

Table 3. Potential MARS Port Operations/Facility Usage				
Potential Facility Usage	**Vessel Type**	**Quantity Assumptions**	**Total Barge / Vessel Trips**	**Phase Associated with Usage**
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 push boat	1 per 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
Total Barge / Vessel Trips			**99**	

EFH Assessment

The MSA defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity," and it requires federal agencies to consult with NOAA Fisheries when proposing activities that may adversely affect EFH. To facilitate consultation, NOAA Fisheries provides an online mapping tool (the EFH Mapper) that can be queried to identify designated EFH species and life stages potentially occurring near the proposed project area (NOAA Fisheries 2020a). Information provided by the EFH Mapper for the action area is included in **Attachment 2**. The Proposed Action includes the construction of a pier and dredging of channels and turning basins in open tidal waters off the north end of Wallops Island. The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR 402.02). For this project, the action area includes the north end of Wallops Island surrounding the UAS airstrip including the surrounding waters from Chincoteague Inlet to the east and north to Bogues Bay to the west – the offshore areas potentially affected by pier construction, dredging of channels and turning basins, placement of dredged sediment, and vessels transiting between the proposed pier and the existing Chincoteague Inlet Federal Channel.

The Proposed Action area is geographically coincident with EFH for one or more life stages of 11 federally-managed fish species. These species and life stages are listed in **Table 4**.

Table 4. Species and Life Stages with Designated EFH in Waters of the Action Area

Species	Eggs	Larvae/ Neonates[1]	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*)[2]		X	X	X
Sandbar shark (*Charcharinus plumbeus*)[2]		X	X	
Smoothhound shark complex – Atlantic stock (*Mustelus canis*)[2]		X	X	X
Summer flounder (*Paralicthys dentatus*)			X	X
Windowpane flounder (*Scophthalmus aquosus)*				X
Winter skate (*Leucoraja ocellata*)			X	X

Notes:
1. An "X" indicates that EFH has been designated within the project area for that species and life stage.
2. The three shark species bear live young (neonates) and thus, do not have a free-swimming larval stage.

Source: NOAA Fisheries (2020a)

The offshore habitats within the action area include tidal marsh communities and the estuarine surface waters of Chincoteague Inlet, Bogues Bay, Ballast Narrows, and other waterways. The nearest beds of submerged aquatic vegetation are approximately 3 miles north of the project area. Waters in the project area contain public and private harvesting areas for shellfish (oysters and clams). These aquaculture areas are mapped in **Figure 5**.

Figure 5. Aquaculture Areas Near Wallops Island

The benthic invertebrate community of the Project Area may be an important EFH component that provides a food source for managed fish species. 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. 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 considered to be representative of the area that includes the pier and the areas 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 130 ft to 930 ft offshore of the tidal marsh.

The majority of organisms in the benthic samples were polychaete worms, which were the dominant taxonomic group and composed 55 percent of the identified individuals. Polychaetes are highly opportunistic and have the ability to rapidly recolonize disturbed areas. 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, threadlike species, 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%) 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. The six samples collected had a 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 as a consequence 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).

In accordance with the EFH Final Rule published in the *Federal Register* on 17 January 2002, federal agencies may incorporate an EFH assessment into documents prepared for another purpose, such as an EA, provided the EFH assessment is clearly identified as a separate and distinct section of the document. The information presented in this letter is based on the analysis provided in the EFH Assessment Worksheet (NOAA Fisheries 2020b) prepared for this consultation (**Attachment 1)**. The four primary elements of the EFH assessment are summarized below:

1. A description of the Proposed Action.

    Provided above; a more detailed description will be provided in the EA concurrently being prepared for the Proposed Action by NASA in compliance with NEPA.

2. An analysis of the potential adverse effects of the Proposed Action on EFH and the managed species.

    Briefly summarized in the EFH Assessment Worksheet (**Attachment 1**) and discussed in more detail below:

    A 1,305-ft fixed pier would be constructed in the northwest portion of the Project Area. It would extend from salt marsh/intertidal habitat through subtidal habitat and into estuarine habitat. A turning basin would be constructed around the pier, impacting estuarine habitat. A vessel approach channel approximately 12,800 ft long and 100 ft wide would be dredged to a final depth of 12 ft below MLLW in estuarine habitat.

    The salt marsh and estuarine habitat within the footprint of the pilings supporting the pier would be permanently converted. These habitats beneath the pier would be shaded, inhibiting plant growth. The submerged structure of the pier would provide substrate for colonization by invertebrates and shelter and foraging habitat for fish. Pier construction and channel/basin dredging could result in temporary, localized impacts from increased noise, turbidity, and sedimentation.

    The benthic community and associated EFH in the vicinity of the proposed pier and dredging would be disturbed. The area of marsh and open water bottom beneath the pier would be approximately 1 acre (ac) in Phase 1 and 1.5 ac in Phase 3. The areas to be dredged, including turning basins and channels, would be approximately 34 ac in Phase 1, 4 ac in Phase 2, and 33 ac in Phase 3. In Phase 3, previously dredged areas would be re-dredged to increase their depth. Thus, the maximum area of bottom to be directly removed by dredging through all phases of the Proposed Action would be approximately 34 ac, and the total area affected by both the pier and dredging would be approximately 35.5 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.

    Dredging impacts to fish and benthic invertebrate prey would occur from direct entrainment (being captured by the dredge bucket). Eggs, larval stages, and sessile or sedentary prey species typically are most susceptible to entrainment. 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.

    Pile driving and dredging during construction of the Proposed Action and maintenance dredging during operation of the pier facility would resuspend sediment in the water column and produce turbidity due to suspended particles and subsequent sedimentation. Generally, high levels of suspended solids and long exposure times produce the greatest mortality. Decreased visibility from increased turbidity 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). Temporary turbidity and sedimentation effects from dredging along the channel and basin may impact nearby privately leased oyster beds (aquaculture).

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. Relatively immobile fish larvae or benthic invertebrate prey could be adversely impacted if extended periods of low dissolved oxygen occur.

Adverse impacts on shellfish from turbidity and sedimentation are unlikely, as the dredging activity would be short in duration and would not cover a large area of shellfish habitat. Additionally, increases in turbidity from dredging are generally similar to those that occur during strong storm events; thus, estuarine organisms have adapted to a wide range of turbidities.

It is expected that there would be a temporary impact on benthic invertebrate prey within the area of pile driving and dredging activities as a result of turbidity and sediment deposition, including anoxic sediments. As discussed above, 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. Additionally, conditions would return to a pre-disturbance state 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. 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 that may be prey for managed fish species (NOAA Fisheries 2020c).

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. 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. Frequent monitoring would be performed during construction to ensure the effectiveness of suspended sediment containment. Thus, the areas of EFH that would be affected by turbidity from the Proposed Action would be minimal in comparison to the extensive surrounding areas, and effects on EFH that may occur in the Project Area would be of short duration.

Portions of the EFH 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 or associated EFH 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 Integrated Contingency Plan and the project-specific Spill Prevention, Control, and Countermeasure Plan.

Ambient noise levels would increase near construction and dredging locations. Some fish and invertebrate prey may be directly affected through their avoidance of noise. Abundance of prey species may also be altered temporarily within the Project Area as prey species migrate away from the construction and dredging activities. Noise effects on aquatic species would be temporary and would occur during limited periods while the equipment is being operated. However, impacts would be temporary and confined to EFH in the immediate vicinity of activities in Ballast Narrows and Chincoteague Inlet.

A small area of EFH would be affected by a proposed improvement to a road. A 130-ft segment of the existing paved access road for the UAS Airstrip would be widened from 15 ft to 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. Extending the culvert would not interfere with fish passage within this headwater drainage and would have a negligible impact on EFH.

3. Conclusions regarding the effects of the Proposed Action on EFH.

   Provided in the EFH Assessment Worksheet (**Attachment 1**) and briefly summarized as follows: NASA has determined that potential adverse effects on EFH from the Proposed Action would be minimal and temporary. The overall determination is that adverse effects on EFH would not be substantial.

4. Proposed mitigation measures.

- In accordance with wetland permitting requirements, wetland mitigation may be required to compensate for impacts to tidal marsh within the footprint of the proposed pier.
- NASA would implement BMPs, described above and in the EFH Assessment Worksheet (**Attachment 1**), to minimize temporary adverse effects, which are briefly summarized as follows:
  - Impacts from sedimentation and erosion would be prevented or minimized through BMPs, which could include turbidity curtains, silt fence, and/or other approved measures to control erosion, turbidity, and sedimentation.
  - Revegetation of areas in the salt marsh using onsite excavated plant material disturbed

by construction or materials staging, in accordance with NASA WFF vegetation management policies, would further minimize potential adverse effects on EFH.

Conclusions

Based on this assessment, NASA has determined that the effects of the Proposed Action on EFH would not be substantial. I certify that we have used the best scientific and commercial data available to complete this assessment and request your concurrence with this determination.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Sincerely,

Shari A. Miller

Shari A. Miller
Center NEPA Manager and
Environmental Planning Lead

Enclosures:
Attachment 1: EFH Assessment Worksheet
Attachment 2: EFH Mapper query results

cc:
250/Ms. K. Finch
250/Mr. T. Meyer
MARAD/Mr. A. Finio
NMFS/Mr. D. O'Brien
NMFS/Mr. B. Hopper
USACE/Mr. B. Denson
VCSFA/Mr. N. Overby

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ATTACHMENT 1: EFH WORKSHEET

NOAA Fisheries Greater Atlantic Regional Fisheries Office
Essential Fish Habitat (EFH) Assessment & Fish and Wildlife Coordination Act (FWCA) Worksheet

This worksheet is your essential fish habitat (EFH) assessment. It provides us with the information necessary to assess the effects of your action on EFH under the Magnuson Stevens Fishery Conservation and Management Act and on NOAA trust resources under the Fish and Wildlife Coordination Act (FWCA). Consultation is not required if:

1. there is no adverse effect on EFH or NOAA trust resources (see page 10 for more info).
2. no EFH is designated and no trust resources may be present at the project site.

Instructions

Federal agencies or their non-federal designated lead agency should email the completed worksheet and necessary attachments to nmfs.gar.efh.consultation@noaa.gov. Include the public notice (if applicable) or project application and project plans showing:

- location map of the project site with area of impact.
- existing and proposed conditions.
- all waters of the U.S. on the project site with mean low water (MLW), mean high water (MHW), high tide line (HTL), and water depths clearly marked.
- sensitive habitats mapped, including special aquatic sites (submerged aquatic vegetation, saltmarsh, mudflats, riffles and pools, coral reefs, and sanctuaries and refuges), hard bottom or natural rocky habitat areas, and shellfish beds.
- site photographs, if available.

We will provide our EFH conservation recommendations and recommendations under the FWCA, as appropriate, within 30 days of receipt of a complete EFH assessment (60 days if an expanded consultation is necessary). Please submit complete information to minimize delays in completing the consultation.

This worksheet provides us with the information required[1] in an EFH assessment:

1. A description of the proposed action.
2. An analysis of the potential adverse effects on EFH and the federally managed species.
3. The federal agency's conclusions regarding the effects of the action on EFH.
4. Proposed mitigation, if applicable.

Your analysis **should focus on impacts that reduce the quality and/or quantity of the habitat or result in conversion to a different habitat type** for all life stages of species with designated EFH within the action area.

Use the information on the HCD website and NOAA's EFH Mapper to complete this worksheet. If you have questions, please contact the appropriate HCD staff member to assist you.

[1] The EFH consultation process is guided by the requirements of our EFH regulation at 50 CFR 600.905.

EFH ASSESSMENT WORKSHEET

General Project Information

Date Submitted:

Project/Application Number:

Project Name: Wallops Island Northern Development

Project Sponsor/Applicant: National Aeronautics and Space Administration (NASA)

Federal Action Agency (if state agency acting as delegated):

Fast-41 or One Federal Decision Project: ☐ Yes ☑ No

Action Agency Contact Name:

Contact Phone: Contact Email:

Latitude: 37.89 Longitude: -75.44

Address, City/Town, State:

NASA Wallops Flight Facility, Accomack County, Virginia

Body of Water: Ballast Narrows near Chincoteague Inlet

Project Purpose:

To construct and operate a port facility to increase safety and reduce costs, traffic, congestion, and air emissions.

Project Description:

The Proposed Action at the Wallops Island Northern Development is the construction of a port: a pier, and an operation area to provide barge access and berthing for offload of large launch vehicle components and related equipment for NASA and the Mid-Atlantic Regional Spaceport (MARS). A vessel approach channel (mostly existing channels) and turning basin would be dredged. The project would be executed in three phases. Construction of a 624-ft long pier under Phase 1 would take approximately 12 months and construction of a 676-ft long pier extension under Phase 2 (for a total pier length 1,305 ft) would take approximately 9.5 months. Phase 1 dredging activities (turning basin and channel) would take approximately 30 days; 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-hours.

Anticipated Duration of In-Water Work or Start/End Dates:

Phase 1 in 2021-2023 and approx. 1-2 years between it and Phases 2 and 3

Habitat Description

EFH includes the biological, chemical, and physical components of the habitat. This includes the substrate and associated biological resources (e.g., benthic organisms, submerged aquatic vegetation, shellfish beds, salt marsh wetlands), the water column, and prey species.

Is the project in designated EFH[2]? ☑ Yes ☐ No

Is the project in designated HAPC[2]? ☐ Yes ☑ No

Is this coordination under FWCA only? ☐ Yes ☑ No

Total area of impact to EFH (indicate sq ft or acres): 1,669,077 sq ft

Total area of impact to HAPC (indicate sq ft or acres): N/A

Current water depths: ~1-9 ft Salinity: ~20-30 ppt Water temperature range: ~6-30 C

Sediment characteristics[3]: Silt and sand

What habitat types are in or adjacent to the project area and will they be permanently impacted? Select all that apply. Indicate if impacts will be temporary, if site will be restored, or if permanent conversion of habitat will occur. A project may occur in overlapping habitat types.

	Habitat Type	**Total impact (sq ft/acres)**	**Impacts are temporary**	**Restored to pre-existing conditions**	**Permanent conversion of all or part of habitat**
☐	Marine				
☑	Estuarine	1,669,077/38			X
☐	Riverine (tidal)				
☐	Riverine (non-tidal)				
☑	Intertidal	14,341/0.33			X
☑	Subtidal	1,654,736/38			X
☐	Water column				
☑	Salt marsh/ Wetland (tidal)	221,720/5.1			X
☐	Wetland (non-tidal)				

[2] Use the tables on pages 7-9 to list species with designated EFH or the type of designated HAPC present.
[3] The level of detail is dependent on your project – e.g., a grain size analysis may be necessary for dredging.

	Habitat Type	Total impact (sq ft/acres)	Impacts are temporary	Restored to pre-existing conditions	Permanent conversion of all or part of habitat
☐	Rocky/hard bottom[4]:				
☐	Sand				
☐	Shellfish beds or oyster reefs				
☐	Mudflats				
☐	Submerged aquatic vegetation (SAV)[5], macroalgae, epifauna				
☐	Diadromous fish (migratory or spawning habitat)				

Indicate type(s) of rocky/hard bottom habitat (pebble, cobble, boulder, bedrock outcrop/ledge) and species of SAV:

N/A

Project Effects

Select all that apply	Project Type/Category
☑	Hatchery or Aquaculture
☐	Agriculture
☐	Forestry
☐	Military (e.g., acoustic testing, training exercises)
☐	Mining (e.g., sand, gravel)
☐	Restoration or fish/wildlife enhancement (e.g., fish passage, wetlands, beach renourishment, mitigation bank/ILF creation)

[4] Indicate type(s). The type(s) of rocky habitat will help you determine if the area is cod HAPC.
[5] Indicate species. Provide a copy of the SAV report and survey conducted at the site, if applicable.

Select all that apply	Project Type/Category
✔	Infrastructure/transportation (e.g., culvert construction, bridge repair, highway, port)
☐	Energy development/use
☐	Water quality (e.g., TMDL, wastewater, sediment remediation)
✔	Dredging/excavation and disposal
✔	Piers, ramps, floats, and other structures
☐	Bank/shoreline stabilization (e.g., living shoreline, groin, breakwater, bulkhead)
☐	Survey (e.g., geotechnical, geophysical, habitat, fisheries)
☐	Other

Select all that apply	Potential Stressors Caused by the Activity
✔	Underwater noise
✔	Water quality/turbidity/ contaminant release
✔	Vessel traffic/barge grounding
☐	Impingement/entrainment[6]
☐	Prevent fish passage/spawning
✔	Benthic community disturbance
☐	Impacts to prey species

Select all that apply and if temporary or permanent		Habitat alterations caused by the activity
Temp	Perm	
☐	✔	Water depth change
☐	☐	Tidal flow change
☐	☐	Fill
☐	✔	Habitat type conversion
☐	☐	Other:
☐	☐	Other:

[6] Entrainment is the voluntary or involuntary movement of aquatic organisms from a water body into a surface diversion or through, under, or around screens and results in the loss of the organisms from the population. Impingement is the involuntary contact and entrapment of aquatic organisms on the surface of intake screens caused when the approach velocity exceeds the swimming capability of the organism.

Details: project impacts and mitigation

The level of detail that you provide should be commensurate with the magnitude of impacts associated with the proposed project. Attach supplemental information if necessary.

Describe how the project would impact each of the habitat types selected above. Include temporary and permanent impact descriptions and direct and indirect impacts.

A 1,305-ft fixed pier would be constructed in the northeast portion of the Project Area. It would extend from salt marsh/intertidal habitat, through subtidal habitat and into estuarine habitat. A turning basin would be constructed around the pier impacting estuarine habitat. A vessel approach channel approximately 12,800 ft long and 100 ft wide would be dredged to a final depth of 12 ft below mean lower low water in estuarine habitat. The salt marsh and estuarine habitat within the footprint of the pilings supporting the pier would be permanently converted. These habitats beneath the pier would be shaded, inhibiting plant growth. The submerged structure of the pier would provide substrate for colonization by invertebrates and shelter and foraging habitat for fish.

What specific measures will be used to avoid impacts, including project design, turbidity controls, acoustic controls, and time of year restrictions? If impacts cannot be avoided, why not?

NASA will use a combination of BMPs, including temporary access matting, turbidity curtains, and soft-start procedures with bubble curtains during pile driving.

What specific measures will be used to minimize impacts?

NASA will use a combination of BMPs, including temporary access matting, turbidity curtains, and soft-start procedures with bubble curtains during pile driving.

Is compensatory mitigation proposed? ☑ Yes ☐ No

If no, why not? If yes, describe plans for mitigation and how this will offset impacts to EFH. Include a conceptual compensatory mitigation and monitoring plan, if applicable.

In accordance with NASA WFF vegetation management policies, vegetation would be re-established in areas of temporary impact. In accordance with wetland permitting requirements, wetland mitigation may be required for impacts to tidal marsh.

Federal Action Agency's EFH determination (select one)	
☐	There is no adverse effect[7] on EFH or EFH is not designated at the project site. EFH Consultation is not required. This is a FWCA-only request.
☑	The adverse effect[7] on EFH is not substantial. This means that the adverse effects are no more than minimal, temporary, or can be alleviated with minor project modifications or conservation recommendations. This is a request for an abbreviated EFH consultation.
☐	The adverse effect[7] on EFH is substantial. This is a request for an expanded EFH consultation. We will provide more detailed information, including an alternatives analysis and NEPA document, if applicable.

EFH and HAPC designations[8]
Use the EFH mapper to determine if EFH may be present in the project area and enter all species and lifestages that have designated EFH. Optionally, you may review the EFH text descriptions linked to each species in the EFH mapper and use them to determine if the described habitat is present. We recommend this for larger projects to help you determine what your impacts are.

Species	EFH is designated/mapped for:				Habitat present based on text description (optional)
	EFH: eggs	EFH: larvae	EFH: juvenile	EFH: adults/ spawning adults	
Atlantic butterfish (Peprilus triacanthus)	☐	☐	☑	☑	☐
Atlantic herring (Clupea harengus)	☐	☐	☐	☑	☐
Black sea bass (Centropristis striata)	☐	☐	☑	☑	☐
Bluefish (Pomatomus saltatrix)	☐	☐	☑	☑	☐

[7] An **adverse effect** is any impact that reduces the quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

[8] Within the Greater Atlantic Region, EFH has been designated by the New England, Mid-Atlantic, and South Atlantic Fisheries Management Councils and NOAA Fisheries.

Species	EFH is designated/mapped for:				Habitat present based on text description (optional)
	EFH: eggs	EFH: larvae	EFH: juvenile	EFH: adults/ spawning adults	
Clearnose skate (Raja eglanteria)	☐	☐	☑	☑	☐
Sand tiger shark (Carcharias taurus)	☐	☑	☑	☑	☐
Sandbar shark (Charcharinus plumbeus)	☐	☑	☑	☐	☐
Smoothhound shark complex - Atlantic stock (Mustelus canis)	☐	☑	☑	☑	☐
Summer flounder (Paralicthys dentatus)	☐	☐	☑	☑	☐
Windowpane flounder (Scophthalmus aguosus)	☐	☐	☐	☑	☐
Winter skate (Leucoraia ocellata)	☐	☐	☑	☑	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
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	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

HAPCs

Select all that are in your action area.

☐	Summer flounder: SAV[9]	☐	Alvin & Atlantis Canyons
☐	Sandbar shark	☐	Baltimore Canyon
☐	Sand Tiger Shark (Delaware Bay)	☐	Bear Seamount
☐	Sand Tiger Shark (Plymouth-Duxbury-Kingston Bay)	☐	Heezen Canyon
☐	Inshore 20m Juvenile Cod	☐	Hudson Canyon
☐	Great South Channel Juvenile Cod	☐	Hydrographer Canyon
☐	Northern Edge Juvenile Cod	☐	Jeffreys & Stellwagen
☐	Lydonia Canyon	☐	Lydonia, Gilbert & Oceanographer Canyons
☐	Norfolk Canyon (Mid-Atlantic)	☐	Norfolk Canyon (New England)
☐	Oceanographer Canyon	☐	Retriever Seamount
☐	Veatch Canyon (Mid-Atlantic)	☐	Toms, Middle Toms & Hendrickson Canyons
☐	Veatch Canyon (New England)	☐	Washington Canyon
☐	Cashes Ledge	☐	Wilmington Canyon

[9] Summer flounder HAPC 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. In locations where native species have been eliminated from an area, then exotic species are included. Use local information to determine the locations of HAPC.

More information

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) mandates that federal agencies conduct an essential fish habitat (EFH) consultation with NOAA Fisheries on any actions they authorize, fund, or undertake that may adversely affect EFH. An **adverse effect** is any impact that reduces the quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

We designed this worksheet to help you to prepare EFH assessments. It is important to remember that an adverse effect determination is a trigger to consult with us. It does not mean that a project cannot proceed as proposed, or that project modifications are necessary. It means that the effects of the proposed action on EFH must be evaluated to determine if there are ways to avoid, minimize, or offset adverse effects.

This worksheet should be used as your EFH assessment or as a guide to develop your EFH assessment. At a minimum, you should include all the information required to complete this worksheet in your EFH assessment. The level of detail that you provide should be commensurate with the magnitude of impacts associated with the proposed project. If your answers in the worksheet and supplemental information you attach do not fully evaluate the adverse effects to EFH, we may request additional information to complete the consultation.

You may need to prepare an expanded EFH assessment for more complex projects to fully characterize the effects of the project and the avoidance and minimization of impacts to EFH. While the EFH assessment worksheet may be used for larger projects, the format may not be sufficient to incorporate the extent of detail required, and a separate EFH assessment may be developed. However, regardless of format, you should include an analysis as outlined in this worksheet for an expanded EFH assessment, along with any additional necessary information. This additional information includes:

- the results of on-site inspections to evaluate the habitat and site-specific effects.
- the views of recognized experts on the habitat or the species that may be affected.
- a review of pertinent literature and related information.
- an analysis of alternatives that could avoid or minimize the adverse effects on EFH.

Please contact our Greater Atlantic Regional Fisheries Office, Protected Resources Division regarding potential impacts to marine mammals or threatened and endangered species.

Useful Links
National Wetland Inventory Maps
https://www.fws.gov/wetlands/
EPA's National Estuary Program (NEP)
https://www.epa.gov/nep/local-estuary-programs
Northeast Regional Ocean Council (NROC) Data Portal
https://www.northeastoceandata.org/
Mid-Atlantic Regional Council on the Ocean (MARCO) Data Portal
http://portal.midatlanticocean.org/

Resources by State

Maine
Maine Office of GIS Data Catalog
https://geolibrary-maine.opendata.arcgis.com/datasets#data
Town shellfish information including shellfish conservation area maps
https://www.maine.gov/dmr/shellfish-sanitation-management/programs/municipal/ordinances/towninfo.html
State of Maine Shellfish Sanitation and Management
https://www.maine.gov/dmr/shellfish-sanitation-management/index.html
Eelgrass maps
https://www.maine.gov/dmr/science-research/species/eelgrass/index.html
Casco Bay Estuary Partnership
https://www.cascobayestuary.org/
Maine GIS Stream Habitat Viewer
https://www.arcgis.com/home/item.html?id=5869c2d20f0b4c3a9742bdd8abef42cb

New Hampshire
NH's Statewide GIS Clearinghouse, NH GRANIT
http://www.granit.unh.edu/
NH Coastal Viewer
http://www.granit.unh.edu/nhcoastalviewer/
State of NH Shellfish Program
https://www.des.nh.gov/organization/divisions/water/wmb/shellfish/

Massachusetts
MA Shellfish Sanitation and Management Program
https://www.mass.gov/shellfish-sanitation-and-management
MassGIS Data, Including Eelgrass Maps
http://maps.massgis.state.ma.us/map_ol/oliver.php
MA DMF Recommended TOY Restrictions Document
https://www.mass.gov/files/documents/2016/08/ry/tr-47.pdf
Massachusetts Bays National Estuary Program
https://www.mass.gov/orgs/massachusetts-bays-national-estuary-program
Buzzards Bay National Estuary Program
http://buzzardsbay.org/
Massachusetts Division of Marine Fisheries

https://www.mass.gov/orgs/division-of-marine-fisheries
Massachusetts Office of Coastal Zone Management
https://www.mass.gov/orgs/massachusetts-office-of-coastal-zone-management

Rhode Island
RI Shellfish and Aquaculture
http://www.dem.ri.gov/programs/fish-wildlife/marine-fisheries/shellfish-aquaculture.php
RI Shellfish Management Plan
http://www.shellfishri.com/
Eelgrass Maps
http://edc.maps.arcgis.com/apps/View/index.html?appid=db52bb689c1e44259c06e11fd24895f8
RI GIS Data
http://ridemgis.maps.arcgis.com/apps/webappviewer/index.html?id=87e104c8adb449eb9f905e5f18020de5
Narragansett Bay Estuary Program
http://nbep.org/
Rhode Island Division of Marine Fisheries
http://www.dem.ri.gov/programs/fish-wildlife/marine-fisheries/index.php
Rhode Island Coastal Resources Management Council
http://www.crmc.ri.gov/

Connecticut
CT Bureau of Aquaculture
https://www.ct.gov/doag/cwp/view.asp?a=3768&q=451508&doagNav=
CT GIS Resources
https://www.ct.gov/deep/cwp/view.asp?a=2698&q=323342&deepNav_GID=1707
Natural Shellfish Beds in CT
https://cteco.uconn.edu/viewer/index.html?viewer=aquaculture
Eelgrass Maps
https://www.fws.gov/northeast/ecologicalservices/pdf/wetlands/2012_CT_Eelgrass_Final_Report_11_26_2013.pdf
Long Island Sound Study
http://longislandsoundstudy.net/
CT GIS Resources
http://cteco.maps.arcgis.com/home/index.html
CT DEEP Office of Long Island Sound Programs and Fisheries
https://www.ct.gov/deep/site/default.asp
CT River Watershed Council
https://www.ctriver.org/

New York
Eelgrass Report
http://www.dec.ny.gov/docs/fish_marine_pdf/finalseagrassreport.pdf
Peconic Estuary Program
https://www.peconicestuary.org/
NY/NJ Harbor Estuary
https://www.hudsonriver.org/estuary-program

New York GIS Clearinghouse
https://gis.ny.gov/

New Jersey
Submerged Aquatic Vegetation Mapping
http://www.crssa.rutgers.edu/projects/sav/
Barnegat Bay Partnership
https://www.barnegatbaypartnership.org/
NJ GeoWeb
https://www.nj.gov/dep/gis/geowebsplash.htm
NJ DEP Shellfish Maps
https://www.nj.gov/dep/landuse/shellfish.html

Pennsylvania
Delaware River Management Plan
https://www.fishandboat.com/Fish/Fisheries/DelawareRiver/Documents/delaware_river_plan_exec_draft.pdf
PA DEP Coastal Resources Management Program
https://www.dep.pa.gov/Business/Water/Compacts%20and%20Commissions/Coastal%20Resources%20Management%20Program/Pages/default.aspx
PA DEP GIS Mapping Tools
https://www.dep.pa.gov/DataandTools/Pages/GIS.aspx

Delaware
Partnership for the Delaware Estuary
http://www.delawareestuary.org/
Center for Delaware Inland Bays
http://www.inlandbays.org/
Delaware FirstMap
http://delaware.maps.arcgis.com/home/index.html

Maryland
Submerged Aquatic Vegetation Mapping
http://web.vims.edu/bio/sav/
MERLIN
http://dnrweb.dnr.state.md.us/MERLIN/
Maryland Coastal Bays Program
https://mdcoastalbays.org/

Virginia
Submerged Aquatic Vegetation mapping
http://www.mrc.virginia.gov/regulations/Guidance_for_SAV_beds_and_restoration_final_approved_by_Commission_7-22-17.pdf
VDGIF Time of Year Restrictions (TOYR) and Other Guidance
https://www.dgif.virginia.gov/wp-content/uploads/VDGIF-Time-of-Year-Restrictions-Table.pdf

ATTACHMENT 2: EFH MAPPER

EFH Data Notice: Essential Fish Habitat (EFH) is defined by textual descriptions contained in the fishery management plans developed by the regional Fishery Management Councils. In most cases mapping data can not fully represent the complexity of the habitats that make up EFH. This report should be used for general interest queries only and should not be interpreted as a definitive evaluation of EFH at this location. A location-specific evaluation of EFH for any official purposes must be performed by a regional expert. Please refer to the following links for the appropriate regional resources.

Greater Atlantic Regional Office
Atlantic Highly Migratory Species Management Division

Query Results

Degrees, Minutes, Seconds: Latitude = 37º53'26" N, Longitude = 76º33'31" W
Decimal Degrees: Latitude = 37.89, Longitude = -75.44

The query location intersects with spatial data representing EFH and/or HAPCs for the following species/management units.

*** W A R N I N G ***

Please note under "Life Stage(s) Found at Location" the category "ALL" indicates that all life stages of that species share the same map and are designated at the queried location.

EFH

Show	Link	Data Caveats	Species/Management Unit	Lifestage(s) Found at Location	Management Council	FMP
			Atlantic Herring	Adult	New England	Amendment 3 to the Atlantic Herring FMP
			Windowpane Flounder	Adult	New England	Amendment 14 to the Northeast Multispecies FMP
			Winter Skate	Adult Juvenile	New England	Amendment 2 to the Northeast Skate Complex FMP
			Clearnose Skate	Adult Juvenile	New England	Amendment 2 to the Northeast Skate Complex FMP
			Sandbar Shark	Juvenile Neonate	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
			Smoothhound Shark Complex (Atlantic Stock)	ALL	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
			Sand Tiger Shark	Neonate/Juvenile Adult	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
			Bluefish	Adult Juvenile	Mid-Atlantic	Bluefish
			Atlantic Butterfish	Adult Juvenile	Mid-Atlantic	Atlantic Mackerel, Squid,& Butterfish Amendment 11
			Summer Flounder	Juvenile Adult	Mid-Atlantic	Summer Flounder, Scup, Black Sea Bass
			Black Sea Bass	Juvenile Adult	Mid-Atlantic	Summer Flounder, Scup, Black Sea Bass

HAPCs

Show	Link	Data Caveats	HAPC Name	Management Council
			Summer Flounder (Mid Atlantic)	MAFMC

EFH Areas Protected from Fishing

No EFH Areas Protected from Fishing (EFHA) were identified at the report location.

Spatial data does not currently exist for all the managed species in this area. The following is a list of species or management units for which there is no spatial data. ****For links to all EFH text descriptions see the complete data inventory: open data inventory -->**
Mid-Atlantic Council HAPCs, No spatial data for summer flounder SAV HAPC.

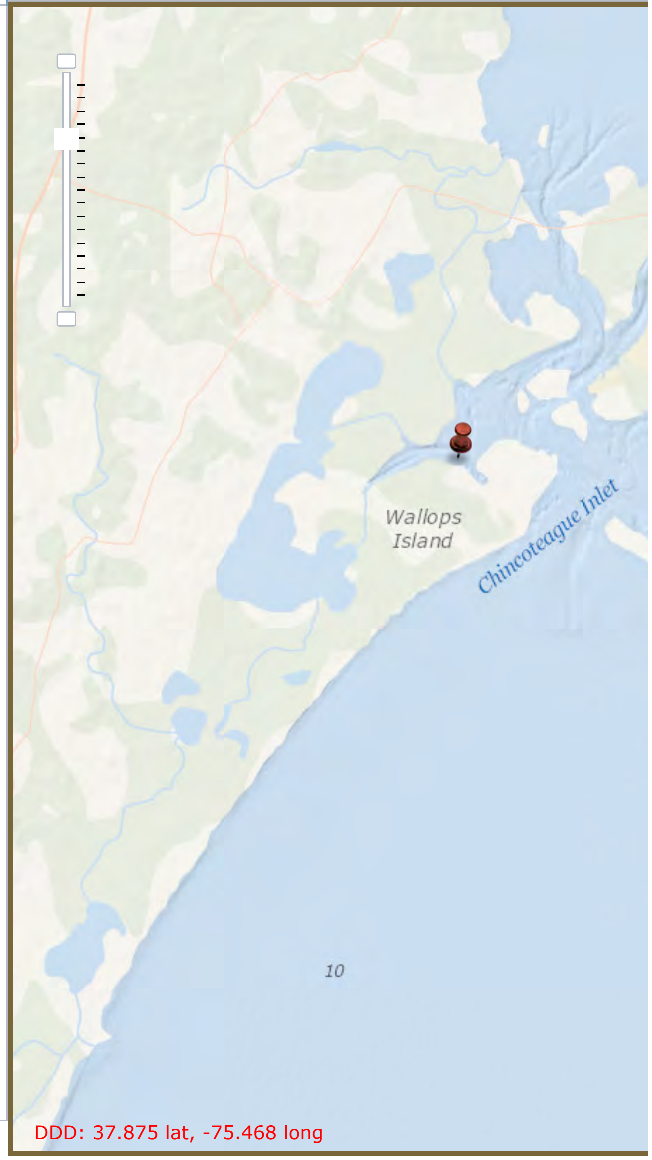
EFH View Tool | Data Query Tool

location.

EFH

Show	Link	Data Caveats	Species/Management Unit	Lifestage(s) Found at Location	Management Council	FM
			Atlantic Herring	Adult	New England	Amend 3 to Atlar Herring
			Windowpane Flounder	Adult	New England	Amend 14 to North Multisp FM
			Winter Skate	Adult Juvenile	New England	Amend 2 to North Ska Comp FM
			Clearnose Skate	Adult Juvenile	New England	Amend 2 to North Ska Comp FM
			Sandbar Shark	Juvenile Neonate	Secretarial	Amend 10 to 200 Consoli HMS F EFI
			Smoothhound Shark Complex (Atlantic Stock)	ALL	Secretarial	Amend 10 to 200 Consoli HMS F EFI

Zoom: Extent: Location Query:



APPENDIX E –

ENDANGERED SPECIES ACT

CONSULTATION

USFWS Consultation

Kisak, Natalie

From: Miller, Shari (WFF-2500) <shari.a.miller@nasa.gov>
Sent: Thursday, March 2, 2023 7:40 PM
To: Brittingham, Alan L. (WFF-013.0)[Virginia Commercial Space Flight Authority]; Warf, Jen; Busam, Michael
Subject: Fwd: Service Response: Project Review Request, Wallops Island Northern Development

Begin Forwarded Message:

From: "Argo, Emily E" <emily_argo@fws.gov>
Subject: [EXTERNAL] Service Response: Project Review Request, Wallops Island Northern Development
Date: 02 March 2023 16:39
To: "Miller, Shari (WFF-2500)" <shari.a.miller@nasa.gov>
Cc: "Andersen, Troy M" <troy_andersen@fws.gov>, "Schulz, Cindy" <cindy_schulz@fws.gov>, "Levine, Lori (GSFC-2500)" <lori.m.levine@nasa.gov>

Shari,

We have reviewed the project package received on December 13, 2022 for the referenced project. The following comments are provided under provisions of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884), as amended.

Following a discussion on January 24, 2023, NASA agreed to accept the March 15-August 31 time of year restriction for both dredging and sand placement activities (S. Miller, NASA, to E. Argo, USFWS, January 25, 2023) and the April 1-November 14 time of year restriction for tree clearing (S. Miller, NASA, to E. Argo, USFWS, January 30, 2023).

Based on the information provided in the BA and the additional discussion and email exchange summarized above, we concur with the determinations provided in the Determination Table dated December 13, 2022 (Table 5 in the BA). Should project plans change or if additional information on the distribution of listed species or critical habitat becomes available, this determination may be reconsidered. If you have any questions, please contact me at 804-824-2405 or emily_argo@fws.gov.

Sincerely,

Emily Argo

Emily E. Argo (she/her)
Fish and Wildlife Biologist
Virginia Field Office
U.S. Fish and Wildlife Service
6669 Short Lane
Gloucester, VA 23061
(804) 824-2405
https://www.fws.gov/northeast/virginiafield

Kisak, Natalie

From: Miller, Shari (WFF-2500) <shari.a.miller@nasa.gov>
Sent: Tuesday, December 13, 2022 4:22 PM
To: 'cindy_schulz@fws.gov'
Cc: Argo, Emily; Finio, Alan (MARAD); Bahnson, Sara E CIV USARMY CENAO (USA); Meyer, T J (WFF-2500); Finch, Kimberly (GSFC-2500); Levine, Lori (GSFC-2500); Brittingham, Alan L. (WFF-013.0) [Virginia Commercial Space Flight Authority]
Subject: RE: Project Review Request, Wallops Island Northern Development, NASA WFF
Attachments: NASA WFF WIND - USFWS_TE Consult Ltr_121322.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Ms. Schulz:

Based upon public comments received on the draft Wallops Island Northern Development Environmental Assessment (WIND EA) and your agency's comments on the Section 7 consultation letter, NASA Wallops Flight Facility and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) are resubmitting the attached consultation. NASA and VA Space propose to construct of a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel. NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Endangered Species Act (ESA) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfil their requirements.

Based on the attached assessment, NASA requests your agency's concurrence with our determination of effects for each of the federally listed species under USFWS jurisdiction potentially occurring in the action area, as summarized in Table 5 of the attached.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Shari A. Miller
Center NEPA Manager and
Natural Resources Lead
NASA GSFC Wallops Flight Facility
Wallops Island, VA 23337
(757) 824-2327
Shari.A.Miller@nasa.gov
https://code200-external.gsfc.nasa.gov/250-wff/

"The smallest act of kindness is worth more than the grandest intention." – Oscar Wilde

---

From: Miller, Shari A. (WFF-2500)
Sent: Wednesday, November 10, 2021 12:15 PM

To: 'cindy_schulz@fws.gov' <cindy_schulz@fws.gov>
Cc: Argo, Emily <emily_argo@fws.gov>; Finio, Alan (MARAD) <alan.finio@dot.gov>; brian.c.denson@usace.army.mil; Nate Overby <nathan.overby@vaspace.org>; TJ Meyer <theodore.j.meyer@nasa.gov>; Kimberly Finch (GSFC-2500) (kimberly.s.finch@nasa.gov) <kimberly.s.finch@nasa.gov>; Levine, Lori M. (GSFC-2500) <lori.m.levine@nasa.gov>
Subject: Project Review Request, Wallops Island Northern Development, NASA WFF

Dear Ms. Schulz:

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) propose to construct a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel. NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Endangered Species Act (ESA) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfil their requirements.

Based on the attached assessment, NASA requests your agency's concurrence with our determination of effects for each of the federally listed species under USFWS jurisdiction potentially occurring in the action area, as summarized in Table 5 of the attached.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Thank you.

Shari A. Miller
Center NEPA Manager &
Natural Resources Manager
NASA GSFC Wallops Flight Facility
Wallops Island, VA 23337
(757) 824-2327
Shari.A.Miller@nasa.gov
https://code200-external.gsfc.nasa.gov/250-wff/

"Remember there's no such thing as a small act of kindness. Every act creates a ripple with no logical end." —Scott Adams

National Aeronautics and Space Administration

Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337

Reply to Attn of: 250.W December 13, 2022

Ms. Cindy Schulz
Virginia Field Office
U.S. Fish and Wildlife Service
6669 Short Lane
Gloucester, Virginia 23061

Re: Project Review Request, Wallops Island Northern Development, NASA Wallops Flight Facility, Accomack County, Virginia

Dear Ms. Schulz:

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) propose to construct a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel (**Figures 1 and 2**). NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Endangered Species Act (ESA) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfill their requirements.

NASA is preparing an Environmental Assessment (EA) in compliance with NEPA to analyze the potential effects of the proposed action on the environment. The EA will be tiered from the May 2019 *NASA WFF Site-Wide Programmatic Environmental Impact Statement* (PEIS), in which NASA evaluated the environmental consequences of constructing and operating new facilities and infrastructure at WFF.

The purpose of this letter is to provide information about the proposed project and to request your concurrence with our determinations regarding potential effects on federally listed threatened and endangered species under United States Fish and Wildlife Service (USFWS) jurisdiction in the action area. Additionally, NASA and VCSFA, along with MARAD and USACE, are concurrently consulting with the National Oceanic and Atmospheric Administration (NOAA) Fisheries on in-water species under their jurisdiction in the action area.

Background

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 2019a). The M-95 Marine Highway Corridor 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 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 2019b).

VCSFA 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 STEM 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 launches to orbital trajectories. This led to the establishment of the Mid-Atlantic Regional Spaceport (MARS) which is owned and operated by VCSFA.

Development of a port and operations area to support the activities of NASA, WFF tenants, and MARS at the north end of Wallops Island was evaluated at a programmatic level of detail in the 2019 *Final Site-wide PEIS* (NASA 2019a). NASA has several long-term tenants and customers that use the WFF research airport and Wallops Island launch range, its facilities, and airspace.

Description of the Proposed Action

Under the Proposed Action, the MARS Port, including a 398-meters (m) (1,305-feet [ft]) fixed pier and turning basin, would be constructed adjacent to the unmanned aerial system (UAS) Airstrip located at the north end of Wallops Island (**Figures 1 and 2**). 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 intermodal facility as part of the MARAD M-95 Marine Highway Corridor. Infrastructure (new upland facilities and improvements to the existing access road, airstrip, and utilities) would likewise be constructed or installed as part of the Proposed Action. Access road improvements would include widening of an existing culvert.

The Proposed Action would also include the dredging of a new and existing channel for enhanced vessel approach purposes (**Figure 3**). The vessel approach channel, which interfaces with two Federal waterways, the Chincoteague Inlet Channel and the Chincoteague Inlet to Bogues Bay connecting waters, would initially be used by a variety of shallow-draft, manned and unmanned vessels. Ultimately, the proposed channel would have a length of approximately 3,900-m (12,800-ft), a width of 30 m (100 ft), and a final depth of 3.7 m (12 ft) below mean lower low water (MLLW). Components of the Proposed Action are further described below.

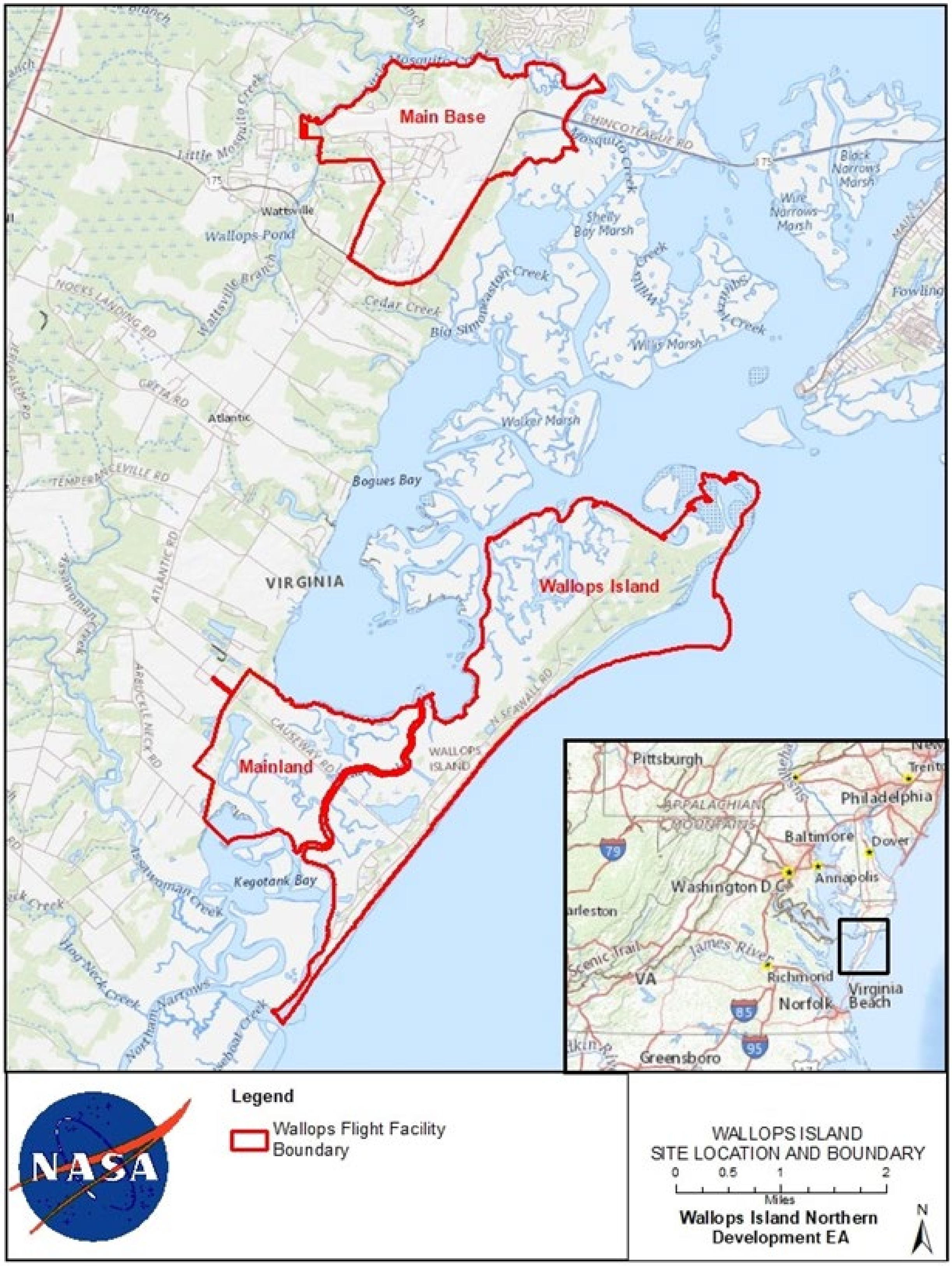


Figure 1: NASA WFF Location

Figure 2: Proposed MARS Port and Infrastructure Components

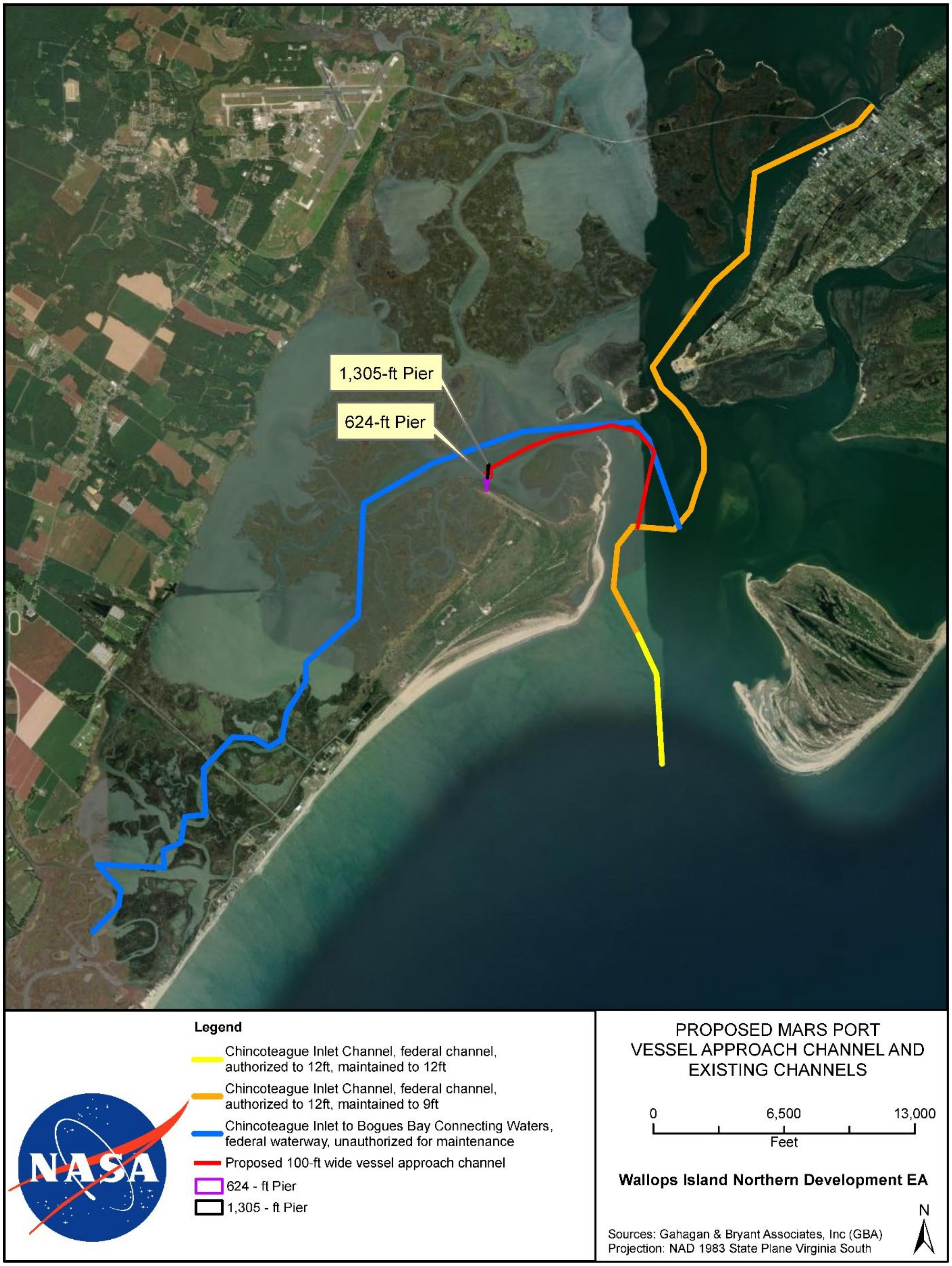


Figure 3: Proposed MARS Port Vessel Approach Channel and Existing Channels

Proposed Action In-Water Components

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. The in-water portion of the Proposed Action would also include the dredging of an existing channel for enhanced vessel approach purposes. The vessel approach 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. The MARS Port would provide a port and operations area along with associated capabilities for MARS, NASA WFF, and other customers. The MARS Port would also serve as a new part of the MARAD M-95 Marine Highway Corridor.

Construction of the Proposed Action would be carried out in three phases:

- **Phase 1** would be construction of a 190-m (624-ft) 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 in **Figure 4**). 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. A 40-m (130-ft) long segment of the access road would be widened from 4.5 m to 9 m (15 ft to 30 ft) in conjunction with the widening of the culvert over which the road crosses a headwater drainage channel to Cow Gut.
- **Phase 2** would be construction of a 206-m (676-ft) 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 4**) to a final depth of 2.7 m (9 ft) below MLLW. Phase 2 would begin approximately 1 to 2 years after Phase 1 is complete.
- **Phase 3** of construction would be additional dredging of the turning basin and vessel approach channel to a final depth of 3.7 m (12 ft) below MLLW, specifically the approximately 3,600-m (11,800-ft)-long portion of the channel from the Phase 2 turning basin to where it meets the Chincoteague Inlet Channel (shaded blue on **Figure 4**). Phase 3 would begin approximately 1 to 2 years after Phase 2 is complete.

Phases for the Proposed Action would be driven by customer need, which would increase operational tempo, and ultimately be tied to available 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 portion of the channel shown in pink on **Figure 4**, 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 2022 and being completed by 2024, with subsequent phases occurring approximately 1 to 2 years after the 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. Additional information about the proposed pier and other port components is provided in Chapter 2 of the Draft EA.

A variety of shallow-draft (0.6- to 1.2-m [2- to 4-ft]), manned and unmanned vessels would be serviced by the 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 requiring approximately 2.4 m (8 ft) of draft. Vessels originating from overseas or from the Ports of New York/New Jersey, Norfolk (Virginia), Baltimore (Maryland), Philadelphia (Pennsylvania), or Wilmington (Delaware) would enter the Chincoteague Inlet Channel and the Bogues Bay connecting waterways to the proposed approach channel and turning basin for the pier (**Figure 3**). The proposed width of the approach channel, approximately 30 m (100 ft), is consistent with the dimensions of the Federal Channel. Estimated dredging volumes for the vessel approach channel and turning basin are provided in **Table 1**.

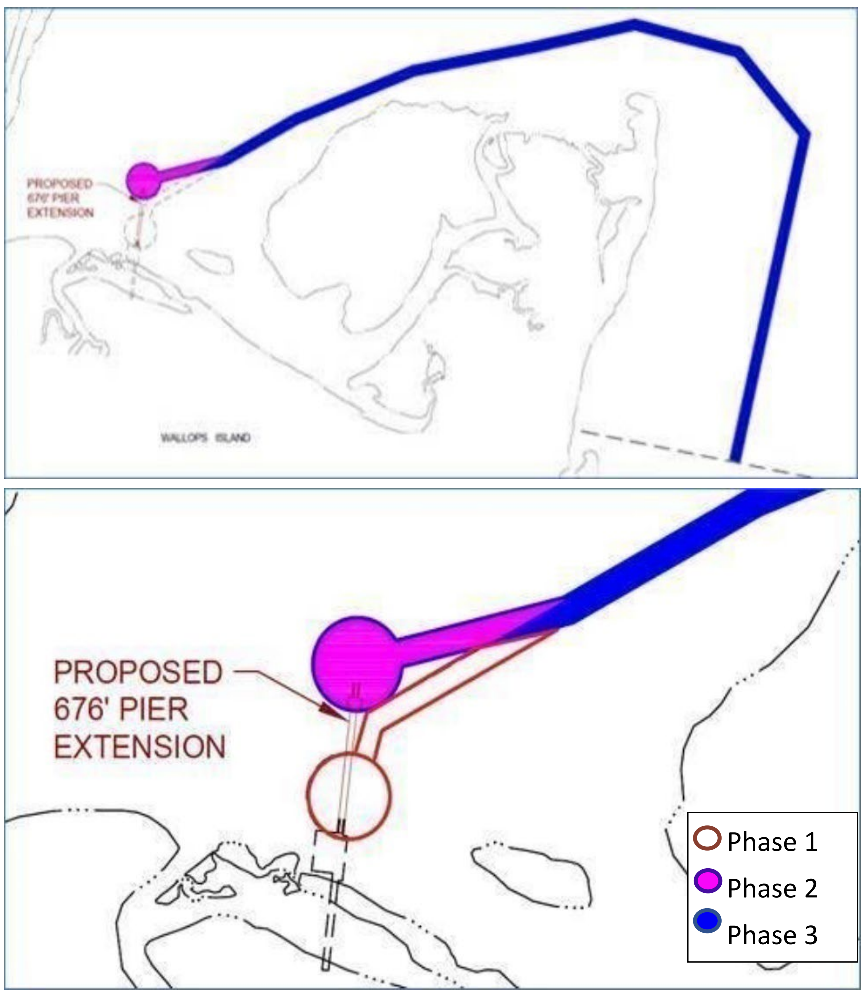


Figure 4: Diagram of Proposed Phased Construction

Table 1. Channel Dimensions and Estimated Dredging Volumes			
	Phase 1	**Phase 2**	**Phase 3**
Channel depth (depth below MLLW)	2.7 m (9 ft)	2.7 m (9 ft)	3.7 m (12 ft)
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)**

m^3 = cubic meters, yd^3 = cubic yards

Dredged Material Placement Decision

The five potential sites considered for the placement of dredged material are summarized in **Table 2** and shown on **Figure 5**. The Proposed Action (Phases 1, 2, and 3) would result in a total volume of 72,100 m^3 (94,200 yd^3) of dredged material requiring placement. VCSFA intends to utilize Option 4, the Wallops Island Shoreline Protection Placement, as the preferred dredged material placement option. 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 (90%+ 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 composed of approximately 95% sand and, therefore, would be suitable for shoreline renourishment.

The material dredged during Phase 1 (between 42,000 m^3 and 43,000 m^3 [56,000 y^3 and 57,000 y^3]) 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). 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.

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 made using historic dredge records made available by the Norfolk District of the USACE. It was assumed that the proposed channel could be maintained at a navigable depth of 2.7 m (9 ft) or 3.6 m (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 cubic meters per year (m^3/yr) (1,400 to 12,000 cubic yards per year [yd^3/yr]), depending on the depth and location(s) that need to be dredged.

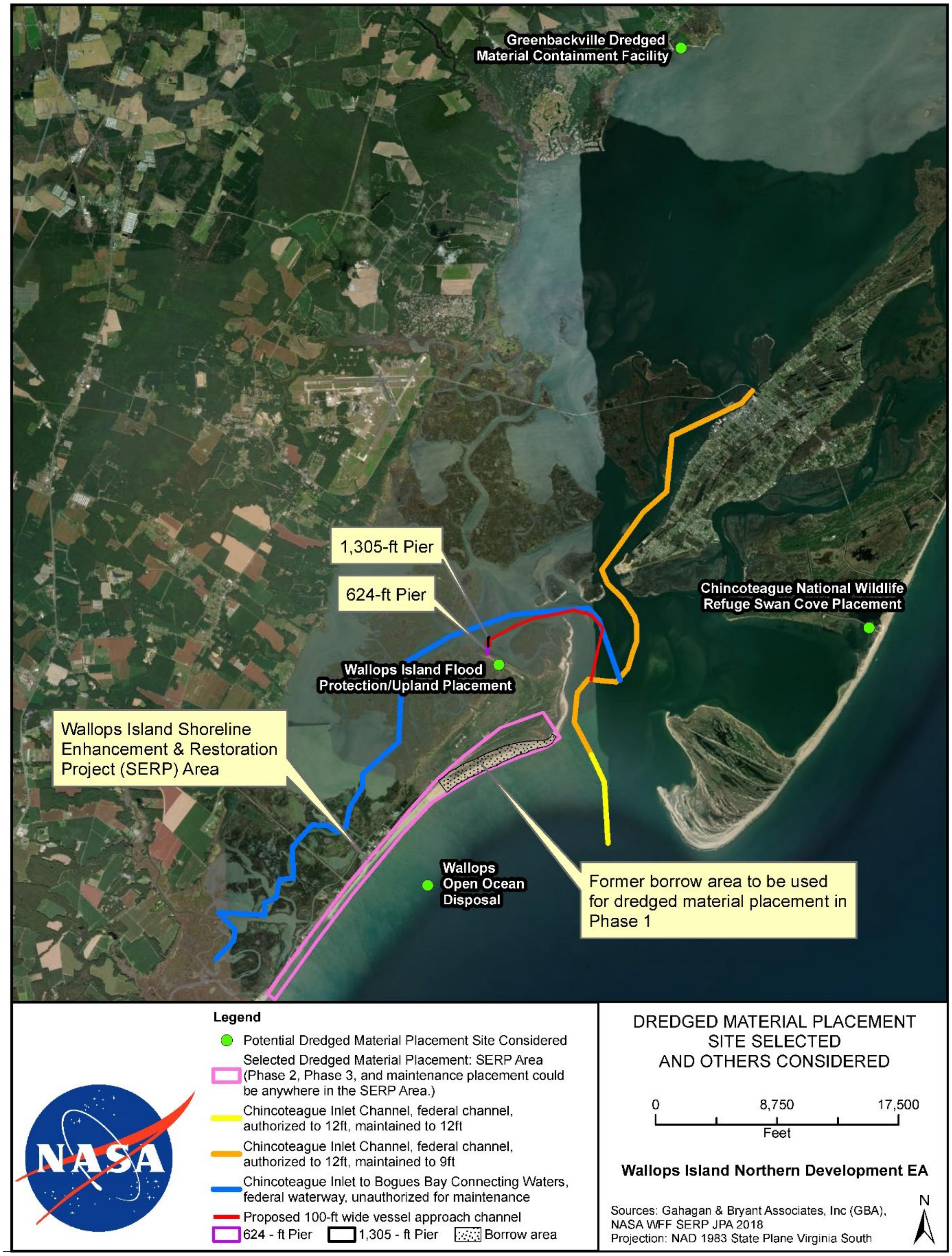


Figure 5. Dredged Material Placement Site Selected and Others Considered

Table 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**	**Description**
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)	--	This area is located just offshore of Wallops Island with a transportation distance of the dredged material of approximately 7.4 km (4 nautical mi). Open water placement options typically present the lowest cost dredging option and allows 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.
2	Wallops Island Flood Protection/ Upland Placement	Reuse of material for flood mitigation through upland placement at site identified by NASA	--	850 m (2,800 ft)	--	3,700 m (12,040 ft)	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 crossing 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.

Table 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**	**Description**
3	Greenbackville, VA, 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)	200 m (650 ft)	The third dredged material placement option identified is the use of the upland Dredged Material Containment Facility (DMCF) owned and managed by the USACE. The 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 18.5 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.

4	Wallops Island Shoreline Protection Placement	Reuse of material for shoreline protection and beach repair	12.1 km (7.5 mi)	--	9.7 km (6 mi)	--	This option would involve the beneficial reuse of clean, compatible sand from the dredged material to repair and protect areas of the shoreline on Wallops Island. Based on the March 2021 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. 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 5**). 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.

Table 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**	**Description**
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)	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 with the Swan Cove Restoration Project design criteria, it would be used by 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 under sized culvert restricting sediment deposition and tidal flow. Although USFWS would prefer material with a high proportion of sand, they would 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. Once pumped, USFWS would assume responsibility for sediment placement and securing appropriate permits.

[1] Sail distance = 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 (statute miles)
[2] Pipe distance = the length of pipe required to reach the placement site from the centroid of dredging or from the anchorage for a vessel loaded with dredged material

Proposed Action Onshore Components

Onshore facilities and infrastructure that would be constructed or upgraded under the Proposed Action are summarized in **Table 3**. Their proposed locations are shown on **Figure 2**. Improvements only apply to existing roads and utilities. No expansion beyond the proposed MARS Port and onshore facilities are anticipated at this time. Any future proposed changes would be addressed in additional NEPA documentation.

Table 3. Onshore Proposed Action Components	
Facility or Element	**Description**
Project support building	A new, approximately 740-square meters (m^2) (8,000-square foot [ft^2]) building may be constructed on at 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 facility is removed or demolished the new facility 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 client usage. 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 without hindering usage of the existing hangar for UAS Airfield operations.
Utility infrastructure	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), which has a 190,000-liter (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 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 proposed temporary holding tank where it would be periodically collected and pumped into the NASA wastewater system for treatment. In accordance with the WFF Integrated Contingency Plan, precautions would be taken prior to and during collection from the temporary tank and pumping into the wastewater collection system.
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.

Table 3. Onshore Proposed Action Components	
Facility or Element	**Description**
Airstrip access road improvements (culvert widening)	The existing 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 constriction and safety and operational hazards. A 40-m (130-ft) segment of the existing paved access road would be widened from 4.6 m (15 ft) to approximately 9.1 m (30 ft), and the culvert over which the road crosses a drainage channel to Cow Gut would also be widened.
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 runway 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 along the north side of the existing UAS Airstrip (inside the drainage infiltration trench) from the intersection with the access road to the new MARS Port pier area.

Summary of Proposed Action Construction Activities

The Proposed Action would involve: (1) construction of the onshore and pier components that would make up the MARS Port, (2) mechanical dredging of the vessel approach channel and turning basin, (3) placement of dredged material, and (4) construction or improvement of the onshore facilities and infrastructure.

The estimated timeframe for construction of the Proposed Action would have Phase 1 beginning in 2022 and being completed by 2024, with subsequent phases occurring approximately 1 to 2 years after completion of the prior phase. 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). 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 398 m [1,305 ft]) would take approximately 9.5 months to complete.

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, tugboat, vibratory pile hammer, diesel impact hammer, concrete truck, concrete pump truck, concrete vibrator, generator, welding machines, cutting torches, and various small tools.

Summary of Proposed Action Operational Activities

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 fencing. During summer months, a mosquito fogging service truck sprays the airfield once every two weeks. Additionally, the pier structure would require quarterly structural inspections.

Potential facility usage associated with the MARS Port is provided in **Table 4**.

Table 4. 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 push boat	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 push boat	Potential for 12 launches per year; 3 trucks per launch	12	1
Venture Class 2 ELV	Shallow-draft deck barge & inland push boat	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 push boat	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

Table 4. Potential MARS Port Operations/Facility Usage

Potential Facility Usage	Vessel Type	Quantity Assumptions	Total Barge / Vessel Trips	Phase Associated with Usage
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
		Total Barge / Vessel Trips	**99**	

Description of the Action Area

The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR 402.02). For this project, the action area includes the north end of Wallops Island surrounding the UAS Airstrip – the onshore areas potentially affected by the construction of onshore facilities and their operation. It also includes the surrounding waters from Chincoteague Inlet to the east and north to Bogues Bay to the west, i.e., the offshore areas potentially affected by pier construction, channel and turning basin dredging, placement of dredged sediment, and vessels transiting between the proposed pier and the existing Chincoteague Inlet Federal Channel. As described above, 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 Wallops Island beach in the SERP area (**Figure 5**). The elements of the ongoing SERP activities to protect Wallops Island shoreline infrastructure through beach renourishment are described in detail in the *2019 SERP EA* (NASA 2019c).

The onshore habitats within the action area on the north end of Wallops Island consist of forested uplands, maritime grasslands, non-tidal wetlands (emergent and scrub-shrub), tidal wetlands, and beaches within the SERP area where dredged sand material would be placed in conjunction with ongoing beach renourishment activities. The dominant habitat within the area is tidal marsh that transitions into upland grass and maritime forest areas adjacent to the UAS airstrip. 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.

The offshore habitats within the action area include tidal marsh communities and the estuarine surface waters of Chincoteague Inlet, Bogues Bay, Ballast Narrows, and other waterways. The nearest beds of submerged aquatic vegetation are approximately 4.8 km (3 miles) north of the action area. Waters in the action area contain public and private harvesting areas for shellfish (oysters and clams).

USFWS Listed Species in the Action Area and Effects Determination

The federally listed species under USFWS jurisdiction that were identified by USFWS as potentially occurring in the action area are described in the species conclusion table (**Table 5**). **Attachment 1** includes the USFWS consultation letter from its Information for Planning and Consultation (IPaC) system that identified the species potentially occurring in the action area.

In 2019, USFWS issued a combined Biological Opinion (BO) for the Proposed and Ongoing Operations and Shoreline Restoration/Infrastructure Protection Program at WFF (USFWS 2019). 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. This plan outlines procedures for monitoring protected species that are likely to occur at Wallops Island, including the northern long-eared bat, red knot, piping plover, and sea turtles. Monitoring reports for these species are prepared annually by WFF and submitted to the USFWS.

The species conclusion table (**Table 5**) provides the ESA Section 7 effects determination for each species (based on the analysis presented in the EA for the Wallops Island Northern Development). The determination of effects on these listed species is further discussed below.

Table 5. Species Conclusions: Determination of Effects on Federally Listed Species under USFWS Jurisdiction

Common Name	Scientific Name	Status[1]	Habitat	Notes	ESA Section 7 Determination of Effect
Mammals					
Northern long-eared bat	*Myotis septentrionalis*	FE	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 on or near Wallops Island (VDWR 2022). In accordance with the 2019 Biological Opinion, NASA and VCSFA would not remove identified maternity roost trees.	May affect, not likely to adversely affect

Table 5. Species Conclusions: Determination of Effects on Federally Listed Species under USFWS Jurisdiction					
Common Name	**Scientific Name**	**Status[1]**	**Habitat**	**Notes**	**ESA Section 7 Determination of Effect**
Birds					
Red knot	*Calidris canutus rufa*	FT	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 2,000 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 and 0 in 2021 (NASA 2021). Dredged material placement would occur on beaches and potentially would increase beach habitat.	May affect, not likely to adversely affect
Piping plover	*Charadrius melodus*	FT	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 (NASA 2021). Dredged material placement would occur on beaches near piping plover habitat and potentially would increase beach habitat (NASA 2019b).	May affect, not likely to adversely affect
Roseate tern	*Sterna dougallii dougallii*	FE	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).	No effect
Eastern black rail	*Laterallus jamaicensis jamaicensis*	FT	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, acoustic surveys conducted in June 2021 and during the 2022 breeding season (three survey rounds between May 1 and June 6), did not detect the species in the action area. Through informal conference with USFWS conducted on 8/16/2019 and subsequent informal consultation, avoidance and minimization measures to be implemented by NASA, VCSFA, and their contractors during construction were identified.	May affect, not likely to adversely affect

Table 5. Species Conclusions: Determination of Effects on Federally Listed Species under USFWS Jurisdiction

Common Name	Scientific Name	Status[1]	Habitat	Notes	ESA Section 7 Determination of Effect
Reptiles					
Loggerhead sea turtle	*Caretta caretta*	FT	Coastal and offshore ocean waters; nests on 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 2019). 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. Due to the transient presence of the species, dredging operations are unlikely to affect the loggerhead sea turtle. Potential occurrence in action area: adults and juveniles migrating and foraging May–November (NOAA Fisheries 2020). 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
Leatherback sea turtle	*Dermochelys coriacea*	FE	Coastal and offshore ocean waters; nests on beaches	Typically nests on tropical or subtropical beaches. Nesting in the action area is unlikely; only one individual demonstrating nesting behavior documented on Assateague Island in 1996. Generally considered oceanic; however, will forage in coastal areas if prey species are available in high densities (NASA 2019). Potential occurrence in action area: adults and juveniles migrating and foraging May–November (NOAA Fisheries 2020). Turtles may stay through early winter (December - January) if water temperatures remain warm (VDWR 2016, Martin 2022).	No effect on nesting turtles
Hawksbill sea turtle	*Eretmochelys imbricata*	FE	Coastal ocean waters; nests on beaches	Unlikely to occur in or near the action area; only two observations in Virginia since 1979 (NASA 2019). Nest in tropics.	No effect on nesting turtles

Table 5. Species Conclusions: Determination of Effects on Federally Listed Species under USFWS Jurisdiction

Common Name	Scientific Name	Status[1]	Habitat	Notes	ESA Section 7 Determination of Effect
Kemp's ridley sea turtle	*Lepidochelys kempii*	FE	Coastal ocean waters; nests on beaches	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). Generally occurs in more sheltered, shallower water habitats than other sea turtle species (NASA 2019). Potential occurrence in action area: adults and juveniles migrating and foraging May–November (NOAA Fisheries 2020).	Nesting: may affect, not likely to adversely affect
Green sea turtle	*Chelonia mydas*	FT	Coastal ocean waters; nests on beaches	Green sea turtles have begun nesting regularly in Virginia; one nested in Virginia in 2021 at an undisclosed location (Argo 2021). Potential occurrence in action area: adults and juveniles migrating and foraging from May–November (NOAA Fisheries 2020).	Nesting: may affect, not likely to adversely affect
Flowering Plants					
Seabeach amaranth	*Amaranthus pumilus*	FT	Area seaward of primary dunes	Species has not been documented at WFF since monitoring began in 2010 (NASA 2019b); nearest documented occurrence is on Assateague Island (NASA 2019a). No primary dunes or beaches in the project limits; therefore, no suitable habitat present.	No effect

[1] FE = federally listed as endangered; FT = federally listed as threatened
Sources: Species and status -- USFWS (2020); habitat and notes -- NASA (2019) unless otherwise noted

Mammals

Northern long-eared bat

On November 29, 2022, the USFWS reclassified the northern long-eared bat to an endangered species status under the ESA and removed the 4(d) rule. Previously, the 4(d) rule defined "takes" and "incidental takes," and allowed the USFWS the ability to provide more specific rules or measures to protect the northern long-eared bat. The USFWS is in the process of developing new guidance to replace the 4(d) rule and associated determination key.

There is no winter hibernacula on or near Wallops Island and this species has not been documented at NASA WFF; it is therefore unlikely to be present in the Project Area. The removal of mature trees would be minimized to the extent possible and limited to those necessary to complete the proposed facilities. NASA and VCSFA would follow the procedures outlined in the letter to USFWS dated August 18, 2015, and in accordance with the 2019 Biological Opinion, would not remove maternity roost trees, should any be identified. Thus, the Proposed Action may affect but is not likely to adversely affect the northern long-eared bat.

Tricolored bat

On September 14, 2022, the USFWS proposed to list the tricolored bat (*Perimyotis subflavus*) as an endangered species under the ESA, throughout its range. According to the USFWS, the primary factor influencing its viability is white nose syndrome with other factors influencing the tricolored bat's viability including habitat loss and effects from climate change (87 FR 177). The U.S. Geological Survey, Virginia Cooperative Fish and Wildlife Research Unit and the Virginia Tech Department of Fisheries and Wildlife Conservation conducted year-round acoustic surveys for bats throughout WFF from October 2016 through April 2018. Though localized both during the summer and dormant-season sampling, the survey determined that activity of the tricolored bat was relatively high at WFF (Barr 2018). As stated above for northern long-eared bats, the removal of mature trees would be minimized to the extent possible and limited to those necessary to complete the proposed facilities. NASA and VCSFA would follow the procedures established for northern long-eared bats and would not remove identified tricolor bat maternity roost trees. Therefore, potential for impacts from the Proposed Action on the tricolored bat are anticipated to negligible

Birds

Status of the Species in the Action Area

Red knot

The red knot is federally 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) which decreased to 117 individuals in 2020, most likely due to construction activities of the WFF SERP (NASA 2020a). There are no beaches on the northwestern side of Wallops Island where onshore components of the Proposed Action would be implemented; however, narrow beaches do exist 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.

Piping plover

The piping plover is federally 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 the nearby Chincoteague National

Wildlife Refuge. Piping plover nests have been documented on coastal beaches along the northeastern side of Wallops Island (**Figure 6**). Suitable habitat for the species is not present in areas where onshore components of the Proposed Action would be implemented. 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.

Eastern black rail

The eastern black rail is federally listed as threatened. 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, a habitat survey was requested by USFWS to identify whether an eastern black rail survey would be needed.

A habitat assessment was conducted in July-August 2020 (NASA 2020b), and a follow-up species presence survey was performed in June 2021 (NASA 2021). The survey was performed in accordance with the Maryland Protocol (Wilson 2015; Gibbs and Melvin 1993), and in any situations where the Maryland Protocol did not specify a condition, the Standardized North American Marsh Bird Monitoring Protocol (SNAMBMP; Conway 2011). The methodology used for these surveys consisted of three broadcast playback field survey efforts between May 1 and July 15, conducted at the two survey stations. Surveys were not conducted in rain, fog, or when wind speeds exceeded 19 kilometers per hour (km/hr) (12 miles per hour [mi/hr]). These surveys were conducted as close to a half hour after sunset as possible to maintain consistency with the Maryland Protocol. Tidal conditions are not defined in the Maryland Protocol, but the SNAMBMP recommends similar tidal levels for all survey events. To maintain consistency with tidal conditions, all surveys were conducted at tide levels within approximately 0.3 m (1 ft) of each other; the tide level at approximately 21:00 on the three dates was approximately 0.6 m (2 ft) high and rising on June 15, 2021 and June 29, 2021 and approximately 0.9 m (3 ft) high and receding on June 22, 2021. Eastern black rails were not detected at either survey station within (or outside) the 400-m (1,300-ft) radii on any of the three survey nights.

An identical acoustic survey for eastern black rail was performed during the 2022 breeding season (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).

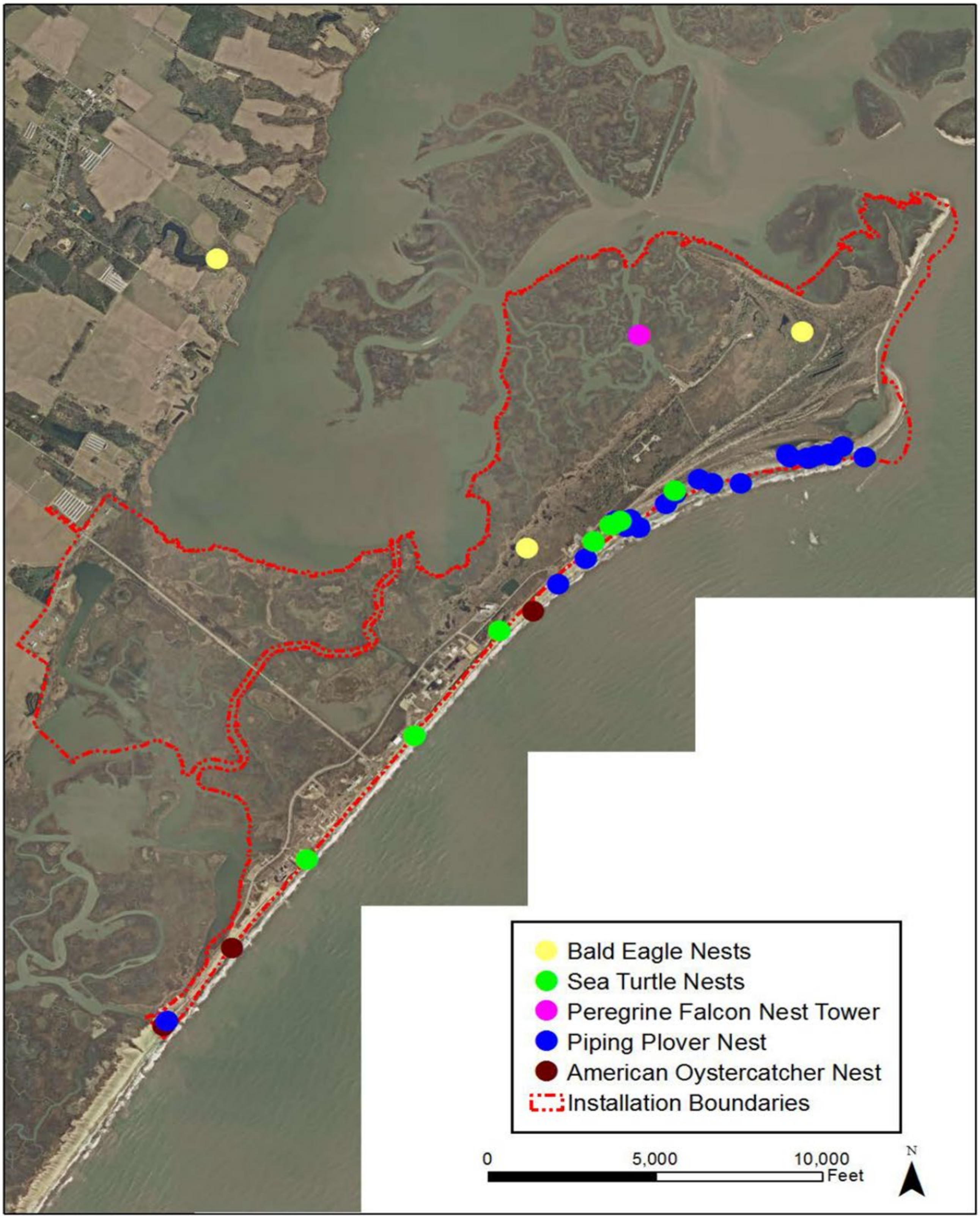


Figure 6. Historic Nesting Sites for Federally Listed and Other Special-Status Species at WFF Wallops Island and Mainland

Effects Determination

The roseate tern occurs offshore and is rarely observed along the U.S. coast south of New Jersey; therefore, the Proposed Action would have no effect on the roseate tern.

Piping plover and Red knot

Onshore construction of the Proposed Action would have the potential to disturb the red knot and piping plover if present in or near the action area due to stressors such as noise, increased human presence, and removal of vegetation potentially providing habitat. Airborne noise can be roughly estimated by assuming the construction equipment required and providing a distance to a noise sensitive receptor. For the replacement of the causeway bridge at the south end of Wallops Island, the noise from piling driving was estimated at 101 decibels A-weighted (dBA) at 15 m (50 ft) (NASA 2019a). In its Programmatic BO on the WFF Shoreline Restoration and Infrastructure Protection Program (NASA 2010), USFWS set protected species monitoring requirements at the 100 dB contours from a rocket launch (NASA 2019a). The nearest recorded piping plover nesting location would be greater than 1,800 m (6,000 ft) from pile-driving activities under the Proposed Action; thus, no airborne noise impacts are anticipated to the red knot or piping plover.

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 piping plover or red knots because onshore habitat for these species near the areas where these activities would occur is absent or minimal. Also, these birds are highly mobile and could avoid these areas during project activities. Therefore, onshore and open-water construction activities of the Proposed Action may affect, but are not likely to adversely affect, the red knot or piping plover because these species occur on beaches, and project construction activities would not occur in beach areas potentially providing suitable habitat for these species.

As described above, 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 (**Figure 5**). The elements of the ongoing project to protect Wallops Island shoreline infrastructure through beach renourishment are described in detail in the *2019 SERP EA* (NASA 2019c). The dredged material placement activities of the Proposed Action would be coordinated with, and incorporated into, the ongoing SERP activities. The associated effects from the placement of sand material on the beaches were evaluated in detail in the *2019 SERP EA*. Piping plover and red knot potentially would be affected by dredged material placement on beaches in the SERP area. In its 2019 BO (USFWS 2019), USFWS determined that the renourishment activities proposed as part of the SERP are likely to adversely affect the piping plover and red knot. (USFWS determined that the SERP is not likely to adversely affect the roseate tern). The 2019 BO included an Incidental Take Statement and required the implementation of measures, terms, and conditions to minimize impacts to the piping plover and red knot. These measures are listed in the *2019 SERP EA* (NASA 2019c). In addition, the VMRC permit for the SERP also prescribes six terms and conditions to reduce impacts to special status species, and these terms are listed in the

2019 SERP EA (NASA 2019c). NASA and VCSFA would follow both USFWS and VMRC permit terms during placement of dredged material into the SERP area.

The dredged material from construction and maintenance of turning basins 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 have been evaluated by USFWS and NMFS in BOs for the SERP (USFWS 2019, NMFS 2012) and would be minimized by implementing any measures, terms, and conditions previously stipulated by the Services that may apply to the beach renourishment activity. Additionally, beneficially using the dredged material on the Wallops Island beach would speed recovery of the borrow area and increase habitat for red knots and piping plover.

Eastern black rail

The eastern black rail potentially could utilize as habitat the salt marsh where the proposed pier would be installed. During the informal conference process with USFWS to determine the area to survey for the presence of eastern black rail, a primary buffer within 15 m (50 ft) around onshore and nearshore construction activities of the pier was established. Beyond the 15-m (50-ft) buffer, a conservative estimate for a preliminary secondary buffer was established to account for potential effects from light, noise, and hydrology changes from the Proposed Action. Noise from construction equipment would likely to be intermittent and temporary. Based on the typical noise from roadway construction equipment, attenuation results in a drop-off rate of 7.5 dBA per doubling of distance for a point source. The noise emission levels at 15 m (50 feet) from the point source for pile driving, scraping, paving, and concrete mixing typically range from 80 to 95 dBA. Assuming the maximum noise from construction of 95 dBA, a nuisance level of 73 dBA and above, combined with the estimated 7.5 dBA attenuation, a conservative potential APE is noted with a 120-m (400-ft) buffer from the Project Area or noise source (California Department of Transportation 2016).

Noise minimization strategies implemented to the extent practicable during construction may include: temporary noise barriers or sound walls, noise pads or dampers, movable task noise barriers, queuing trucks to distribute idling noise, locating vehicle access points and loading and shipping facilities away from habitat areas, reducing the number of noisy activities that occur simultaneously, relocating stationary equipment away from habitat areas, and use of vibration reducing modifications to construction equipment. Implementing these practices would minimize potential effects on the eastern black rail. Additionally, based on the 2021 and 2022 breeding season surveys, it is unlikely that eastern black rail nest in the action area. Therefore, NASA has determined that the construction of the Proposed Action may affect, but is not likely to adversely affect, the eastern black rail.

Summary

Activities associated with the operation of the proposed port would be like other commercial boating activities occurring with relative frequency in and around the action area. Such activities 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 red knot, piping plover, and eastern black rail would be insignificant or discountable. Accordingly, the Proposed Action may affect, but is not likely to be adversely affect, these bird species. It would have no effect on the roseate tern.

Sea Turtles

Status of the Species

For management purposes, the loggerhead sea turtle population is organized into nine distinct population segments (DPS), four that are listed as threatened and five that are listed as endangered. Loggerheads occurring at or near WFF belong to the Northwest Atlantic DPS, which is federally 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. 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 (NASA 2021b). The closest nest to the Project Area was approximately 2.1 km (1.3 mi) south of the UAS Airstrip (**Figure 6**). Suitable loggerhead nesting habitat is not present in onshore areas where components of the Proposed Action would be implemented.

The leatherback sea turtle is federally 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 kilograms (kg) (2,000 pounds [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 in tropical waters. Leatherbacks have never been sighted at WFF, but are known to occur in the waters offshore of Accomack County (NASA 2017).

The hawksbill sea turtle is federally listed as endangered. It can reach up to 0.9 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 directly observed at WFF (NASA 2017). They may occur in offshore waters, but their preferred tropical habitat is not present at or near WFF.

The Kemp's ridley sea turtle is federally listed as endangered. It is the smallest of all sea turtles, growing to 0.7 m (28 inches) 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. It is 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).

The green sea turtle is federally listed as threatened. This species is the largest of all the hard-shelled marine turtles, growing to a length of 0.9 m (3 ft) and weighing up to 159 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 been observed in waters off WFF and are likely to inhabit the waters off WFF during the warmer months when sea grasses and algae are plentiful (NASA 2017). Green sea turtles have begun nesting regularly in Virginia with the most recent nesting occurring in 2021 at an undisclosed location (Argo 2021).

Effects Determination

Onshore Components

Loggerhead sea turtles are often seen in the channels and inlets of Virginia's barrier islands. Between 2008 and 2013, loggerhead sea turtle nests were periodically found on mid and south Wallops Island beaches, approximately 2.6 km (1.6 mi) southwest of the Proposed Action. Nighttime UAS airstrip lighting could disorient nesting females and emerging hatchlings; however, this type of indirect impact would not be anticipated. UAS would operate infrequently at night; 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. Given that measures would be implemented to minimize lighting effects, implementation of the onshore components of the Proposed Action would not adversely impact loggerhead sea turtles.

Dredging Material Placement

Terrestrial impacts from construction activities are unlikely to adversely affect sea turtle nests due to the lack of nesting sites within the action area. Loggerhead sea turtle nesting sites have been found on Wallops Island beaches outside of the action area (**Figure 6**) but were last observed in 2013 (NASA 2021b). 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 near the action area. Due to the lack of nesting habitat in the action area where construction activities would occur, the Proposed Action would have no effect on nesting sea turtles.

However, as described above, 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 (**Figure 5**). The elements of the ongoing project to protect Wallops Island shoreline infrastructure through beach renourishment are described in detail in the *2019 SERP EA* (NASA 2019c). The dredged material placement activities of the Proposed Action would be coordinated with, and incorporated into, the ongoing SERP activities, and the associated effects from the placement of sand material on the beaches were evaluated in detail in the *2019 SERP EA*.

In its 2019 BO (USFWS 2019), USFWS determined that the renourishment activities proposed as part of the SERP are likely to adversely affect the loggerhead sea turtle, but are not likely to adversely affect the hawksbill sea turtle, leatherback sea turtle, Kemp's ridley sea turtle, or green sea turtle. The 2019 BO included an Incidental Take Statement and required the implementation of measures, terms, and conditions to minimize impacts to the loggerhead sea turtle. These measures are listed in the *2019 SERP EA* (NASA 2019c). In addition, the VMRC permit for the SERP also prescribes six terms and conditions to reduce impacts to special status species, and these terms are listed in the *2019 SERP EA* (NASA 2019c). NASA and VCSFA would follow both USFWS and VMRC permit terms during placement of dredged material into the SERP area.

The dredged material from construction and maintenance of turning basins 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 have been evaluated by USFWS and NMFS in BOs for the SERP (USFWS 2019, NMFS 2012) and would be minimized by implementing any measures, terms, and conditions previously stipulated by the Services that may apply to the beach renourishment activity.

For these reasons, the effects of the Proposed Action on nesting sea turtles would be insignificant or discountable and not likely to adversely affect loggerhead, Kemp's ridley, or green sea turtles. The Proposed Action would have no effect on leatherback and hawksbill sea turtles, which do not nest in the region of the action area.

Flowering Plants

Seabeach amaranth has not been documented at WFF. Its habitat is the area seaward of primary dunes, but there are no primary dunes or beaches in the action area. Therefore, suitable habitat is not present in the construction area, and construction and operation of the Proposed Action would have no effect on seabeach amaranth. In a 2019 BO (USFWS 2019), USFWS determined that the renourishment activities proposed as part of the SERP are not likely to adversely affect the seabeach amaranth. The placement of dredged material from the Proposed Action would be incorporated as a component of the SERP.

Insects

The monarch butterfly was designated by the USFWS in December 2020 as a candidate species for listing as threatened or endangered under the ESA; its status will be reviewed each year. The monarch is dependent on milkweeds for breeding habitat because they are the only food source for monarch caterpillars. The action area is unlikely to provide habitat for milkweeds. During migration, monarchs may occur in vegetated areas anywhere and may utilize a wide variety of nectar-producing flowers for food. Thus, they could transit through the action area during migration. Approximately 0.4 hectare (ha) (1.1 acre [ac]) of upland vegetation would be lost due to the Proposed Action. Extensive vegetation would remain around the airstrip and in other areas of NASA WFF as well as nearby National Wildlife Refuges maintained by USFWS. 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 potentially providing habitat for the monarch butterfly would be minor, and the potential for impacts on the monarch butterfly would be negligible.

Best Management Practices Summary

To further reduce impacts on listed species, construction Best Management Practices (BMPs) may be implemented. The construction contractor would use erosion and sediment control measures in upland areas to minimize or prevent the erosion of exposed soils by wind and water and corresponding sedimentation of receiving water bodies. Accidental spills of fuel or other hazardous substances would be prevented or minimized through the contractor's adherence to the spill prevention and control measures as specified in the WFF's *Integrated Contingency Plan* and the project-specific Spill Prevention, Control, and Countermeasure Plan. Vegetation removed in areas impacted for construction access would be replaced in accordance with the NASA WFF vegetation management policies. BMPs could include, but would not be limited to, erosion control measures, noise and vibration reduction measures (including construction techniques such as vibratory dampening), minimization of lighting frequency and/or duration in work areas to the extent practicable while maintaining safe working conditions, and the incorporation of downward pointing and/or low-glare lighting, to minimize any long-term effects on protected species.

The intensity and duration of construction activity and the areas disturbed would vary throughout the Proposed Action's construction phases, resulting in corresponding variations in the intensity and duration of short-term impacts. The phased implementation of the Proposed Action would distribute potential impacts on listed species over multiple years, thereby minimizing impacts by ensuring that not all impacts occur simultaneously. Contractors would implement and adhere to BMPs to the extent practicable to further minimize adverse effects on listed species.

Conclusions

NASA requests your agency's concurrence with our determination of effects for each of the federally listed species under USFWS jurisdiction potentially occurring in the action area, as summarized in **Table 5**.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Sincerely,

Shari A. Miller
Center NEPA Manager and
Environmental Planning Lead

Enclosures
Attachment 1, USFWS Consultation Letter/Species List

cc:
250/Ms. K. Finch
250/Mr. T. Meyer
MARAD/Mr. A. Finio
USACE/Mr. S. Bahnson
VCSFA/Mr. A. Brittingham

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ATTACHMENT 1: USFWS SPECIES LIST

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
Phone: (804) 693-6694 Fax: (804) 693-9032

In Reply Refer To: December 13, 2022
Project Code: 2023-0024496
Project Name: Wallops Island Northern Development w/ dredge placement

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see https://www.fws.gov/birds/policies-and-regulations.php.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds.php.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/executive-orders/e0-13186.php.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Project Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Coastal Barriers

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
(804) 693-6694

Project Summary

Project Code: 2023-0024496
Project Name: Wallops Island Northern Development w/ dredge placement
Project Type: New Constr - Above Ground
Project Description: Construction and operation of a pier/port, with construction of associated buildings near the NASA unmanned aerial systems (UAS) airstrip and offshore dredging of channels and turning basins.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@37.91841735,-75.4305919317938,14z

Counties: Accomack County, Virginia

Endangered Species Act Species

There is a total of 12 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered

Birds

NAME	STATUS
Eastern Black Rail *Laterallus jamaicensis ssp. jamaicensis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10477	Threatened
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* There is **proposed** critical habitat for this species. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Roseate Tern *Sterna dougallii dougallii* Population: Northeast U.S. nesting population No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2083	Endangered

Reptiles

NAME	STATUS
Green Sea Turtle *Chelonia mydas* Population: North Atlantic DPS There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6199	Threatened
Hawksbill Sea Turtle *Eretmochelys imbricata* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3656	Endangered
Kemp's Ridley Sea Turtle *Lepidochelys kempii* There is **proposed** critical habitat for this species. Species profile: https://ecos.fws.gov/ecp/species/5523	Endangered
Leatherback Sea Turtle *Dermochelys coriacea* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1493	Endangered
Loggerhead Sea Turtle *Caretta caretta* Population: Northwest Atlantic Ocean DPS There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1110	Threatened

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

Flowering Plants

NAME	STATUS
Seabeach Amaranth *Amaranthus pumilus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8549	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

The following FWS National Wildlife Refuge Lands and Fish Hatcheries lie fully or partially within your project area:

FACILITY NAME	ACRES
CHINCOTEAGUE NATIONAL WILDLIFE REFUGE https://www.fws.gov/refuges/profiles/index.cfm?id=51570	9,821.891

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Oystercatcher *Haematopus palliatus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8935	Breeds Apr 15 to Aug 31
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Oct 15 to Aug 31

NAME	BREEDING SEASON
Black Scoter *Melanitta nigra* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Black Skimmer *Rynchops niger* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/5234	Breeds May 20 to Sep 15
Black-billed Cuckoo *Coccyzus erythropthalmus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10
Blue-winged Warbler *Vermivora pinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds May 1 to Jun 30
Bobolink *Dolichonyx oryzivorus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Jul 31
Brown Pelican *Pelecanus occidentalis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Jan 15 to Sep 30
Canada Warbler *Cardellina canadensis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Aug 10
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 15 to Aug 25
Common Eider *Somateria mollissima* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Jun 1 to Sep 30
Common Loon *gavia immer* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/4464	Breeds Apr 15 to Oct 31

NAME	BREEDING SEASON
Double-crested Cormorant *phalacrocorax auritus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/3478	Breeds Apr 20 to Aug 31
Dovekie *Alle alle* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/6041	Breeds elsewhere
Great Shearwater *Puffinus gravis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Gull-billed Tern *Gelochelidon nilotica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9501	Breeds May 1 to Jul 31
Hudsonian Godwit *Limosa haemastica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Kentucky Warbler *Oporornis formosus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 20
King Rail *Rallus elegans* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8936	Breeds May 1 to Sep 5
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Long-tailed Duck *Clangula hyemalis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/7238	Breeds elsewhere
Pomarine Jaeger *Stercorarius pomarinus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere

NAME	BREEDING SEASON
Prairie Warbler *Dendroica discolor* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Prothonotary Warbler *Protonotaria citrea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 1 to Jul 31
Purple Sandpiper *Calidris maritima* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Razorbill *Alca torda* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Jun 15 to Sep 10
Red Phalarope *Phalaropus fulicarius* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Red-breasted Merganser *Mergus serrator* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Red-necked Phalarope *Phalaropus lobatus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Red-throated Loon *Gavia stellata* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Ring-billed Gull *Larus delawarensis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Roseate Tern *Sterna dougallii* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds May 10 to Aug 31

NAME	BREEDING SEASON
Royal Tern *Thalasseus maximus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Apr 15 to Aug 31
Ruddy Turnstone *Arenaria interpres morinella* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Short-billed Dowitcher *Limnodromus griseus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9480	Breeds elsewhere
Surf Scoter *Melanitta perspicillata* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
White-winged Scoter *Melanitta fusca* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Willet *Tringa semipalmata* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 5
Wilson's Storm-petrel *Oceanites oceanicus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

■ probability of presence ■ breeding season | survey effort – no data

SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

American Oystercatcher
BCC Rangewide (CON)

Bald Eagle
Non-BCC Vulnerable

Black Scoter
Non-BCC Vulnerable

Black Skimmer
BCC Rangewide (CON)

Black-billed Cuckoo
BCC Rangewide (CON)

Blue-winged Warbler
BCC - BCR

Bobolink
BCC Rangewide (CON)

Brown Pelican
Non-BCC Vulnerable

Canada Warbler
BCC Rangewide (CON)

Chimney Swift
BCC Rangewide (CON)

Common Eider
Non-BCC Vulnerable

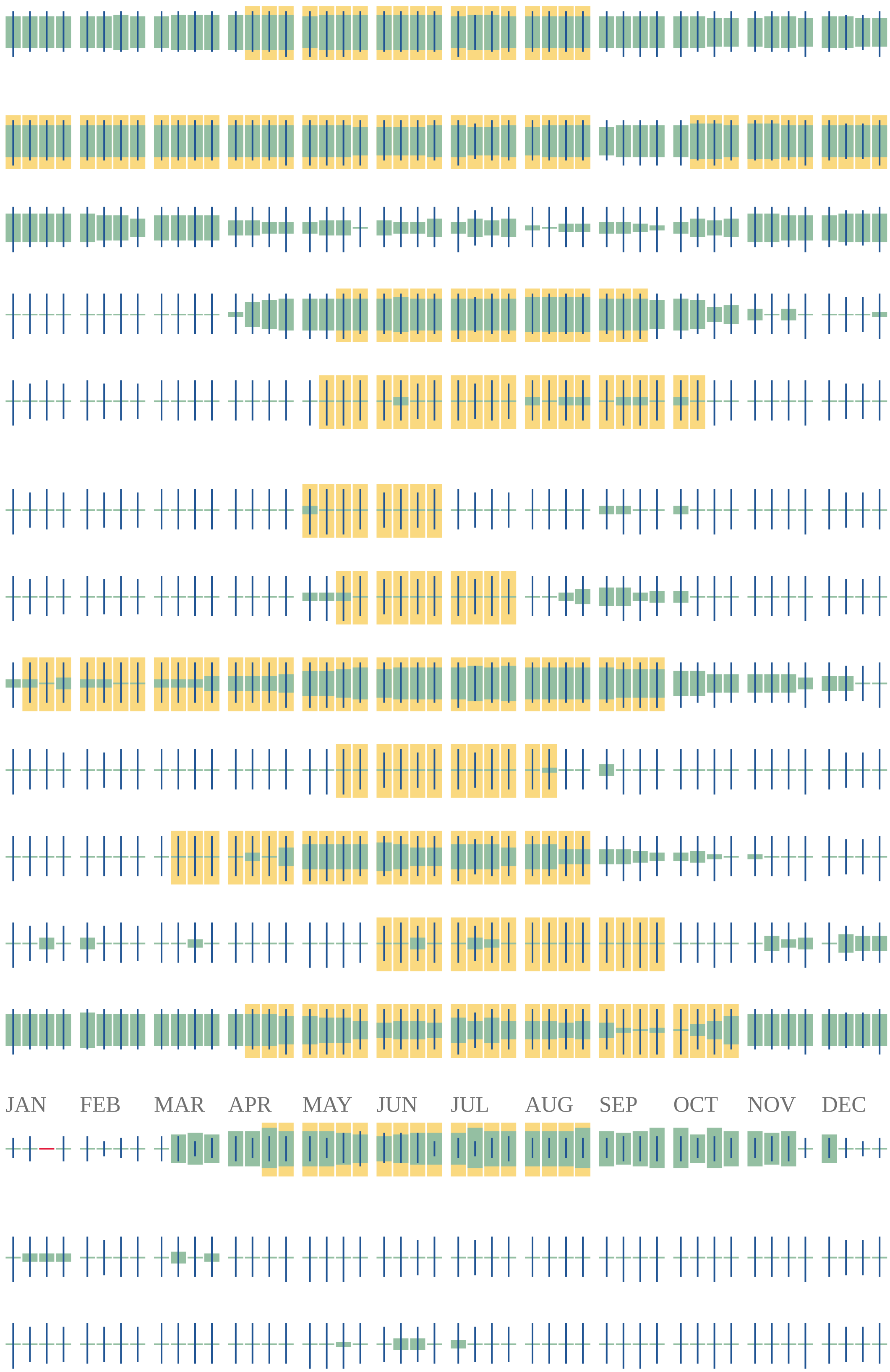
Common Loon
Non-BCC Vulnerable

SPECIES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Double-crested Cormorant
Non-BCC Vulnerable

Dovekie
Non-BCC Vulnerable

Great Shearwater
Non-BCC Vulnerable




Gull-billed Tern
BCC Rangewide
(CON)
Hudsonian Godwit
BCC Rangewide
(CON)
Kentucky Warbler
BCC Rangewide
(CON)
King Rail
BCC Rangewide
(CON)
Lesser Yellowlegs
BCC Rangewide
(CON)
Long-tailed Duck
Non-BCC
Vulnerable
Pomarine Jaeger
Non-BCC
Vulnerable
Prairie Warbler
BCC Rangewide
(CON)
Prothonotary
Warbler
BCC Rangewide
(CON)
SPECIES
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
Purple Sandpiper
BCC Rangewide
(CON)
Razorbill
Non-BCC
Vulnerable
Red Phalarope
Non-BCC
Vulnerable
Red-breasted
Merganser
Non-BCC
Vulnerable
Red-headed
Woodpecker
BCC Rangewide
(CON)
Red-necked
Phalarope

Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds

- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be

aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Coastal Barriers

Projects within the John H. Chafee Coastal Barrier Resources System (CBRS) may be subject to the restrictions on Federal expenditures and financial assistance and the consultation requirements of the Coastal Barrier Resources Act (CBRA) (16 U.S.C. 3501 et seq.). For more information, please contact the local Ecological Services Field Office or visit the CBRA Consultations website. The CBRA website provides tools such as a flow chart to help determine whether consultation is required and a template to facilitate the consultation process.

Otherwise Protected Area (OPA)

OPAs are denoted with a "P" at the end of the unit number. The only prohibition within OPAs is on Federal flood insurance. ***CBRA consultation is not required for projects within OPAs.*** *However, agencies providing disaster assistance that is contingent upon a requirement to purchase flood insurance after the fact are advised to disclose the OPA designation and information on the restrictions on Federal flood insurance to the recipient prior to the commitments of funds.*

UNIT	NAME	TYPE	SYSTEM UNIT ESTABLISHMENT DATE	FLOOD INSURANCE PROHIBITION DATE
VA-01P	Assateague Island	OPA	N/A	11/16/1991

IPaC User Contact Information

Agency: AECOM
Name: Natalie Kisak
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City: Germantown
State: MD
Zip: 20876
Email natalie.kisak@aecom.com
Phone: 3018203255

From: Miller, Shari A. (WFF-2500) <shari.a.miller@nasa.gov>
Sent: Wednesday, November 10, 2021 12:15 PM
To: 'cindy_schulz@fws.gov'
Cc: Argo, Emily; Finio, Alan (MARAD); brian.c.denson@usace.army.mil; Nate Overby; Meyer, T J (WFF-2500); Finch, Kimberly (GSFC-2500); Levine, Lori M. (GSFC-2500)
Subject: Project Review Request, Wallops Island Northern Development, NASA WFF
Attachments: NASA WIND - USFWS_T&E Consult Ltr_111021.pdf

Dear Ms. Schulz:

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) propose to construct a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel. NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Endangered Species Act (ESA) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfil their requirements.

Based on the attached assessment, NASA requests your agency's concurrence with our determination of effects for each of the federally listed species under USFWS jurisdiction potentially occurring in the action area, as summarized in Table 5 of the attached.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Thank you.

Shari A. Miller
Center NEPA Manager &
Natural Resources Manager
NASA GSFC Wallops Flight Facility
Wallops Island, VA 23337
(757) 824-2327
Shari.A.Miller@nasa.gov
https://code200-external.gsfc.nasa.gov/250-wff/

"Remember there's no such thing as a small act of kindness. Every act creates a ripple with no logical end." —Scott Adams

National Aeronautics and Space Administration

Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337

Reply to Attn of: 250.W

November 10, 2021

Ms. Cindy Schulz
Virginia Field Office
U.S. Fish and Wildlife Service
6669 Short Lane
Gloucester, Virginia 23061

Re: Project Review Request, Wallops Island Northern Development, NASA Wallops Flight Facility, Accomack County, Virginia

Dear Ms. Schulz:

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) propose to construct a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel (**Figures 1 and 2**). NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Endangered Species Act (ESA) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfil their requirements.

NASA is preparing an Environmental Assessment (EA) in compliance with NEPA to analyze the potential effects of the proposed action on the environment. The EA will be tiered from the May 2019 *NASA WFF Site-Wide Programmatic Environmental Impact Statement* (PEIS), in which NASA evaluated the environmental consequences of constructing and operating new facilities and infrastructure at WFF.

The purpose of this letter is to provide information about the proposed project and to request your concurrence with our determinations regarding potential effects on federally listed threatened and endangered species under United States Fish and Wildlife Service (USFWS) jurisdiction in the action area. Additionally, NASA and VCSFA, along with MARAD and USACE, are concurrently consulting with the National Oceanic and Atmospheric Administration's Marine Fisheries Service on in-water species under their jurisdiction in the action area.

Background

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 2019a). The M-95 Marine Highway Corridor 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 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 2019b).

VCSFA 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 STEM 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 launches to orbital trajectories. This led to the establishment of the Mid-Atlantic Regional Spaceport (MARS) which is owned and operated by VCSFA.

Development of a port and operations area to support the activities of NASA, WFF tenants, and MARS at the north end of Wallops Island was evaluated at a programmatic level of detail in the 2019 *Final Site-wide PEIS* (NASA 2019a). NASA has several long-term tenants and customers that use the WFF research airport and Wallops Island launch range, its facilities, and airspace.

Description of the Proposed Action

Under the Proposed Action, the MARS Port, including a 1,305-ft fixed pier and turning basin, would be constructed adjacent to the unmanned aerial system (UAS) Airstrip located at the north end of Wallops Island (**Figures 1 and 2**). 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 intermodal facility as part of the MARAD M-95 Marine Highway Corridor. Infrastructure (new upland facilities and improvements to the existing access road, airstrip, and utilities) would likewise be constructed or installed as part of the Proposed Action. Access road improvements would include widening of an existing culvert.

The Proposed Action would also include the dredging of a new and existing channel for enhanced vessel approach purposes (**Figure 3**). The vessel approach channel, which interfaces with two Federal waterways, the Chincoteague Inlet Channel and the Chincoteague Inlet to Bogues Bay connecting waters, would initially be used by a variety of shallow-draft, manned and unmanned vessels. Ultimately, the proposed channel would have a length of approximately 12,800 ft, a width of 100 ft, and a final depth of 12 ft below mean lower low water (MLLW). Components of the Proposed Action are further described below.

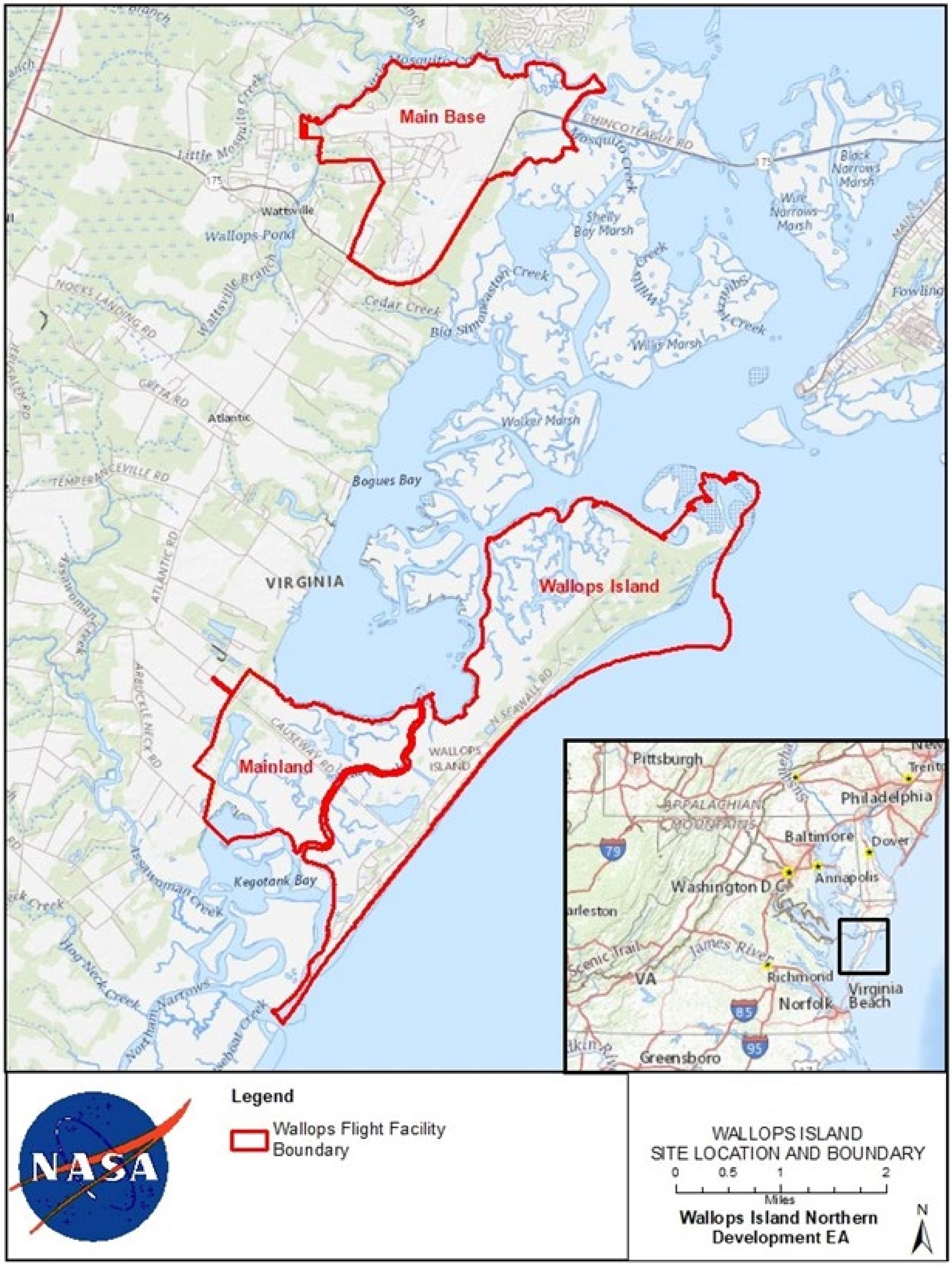

Figure 1: NASA WFF Location

Figure 2: Proposed MARS Port and Infrastructure Components

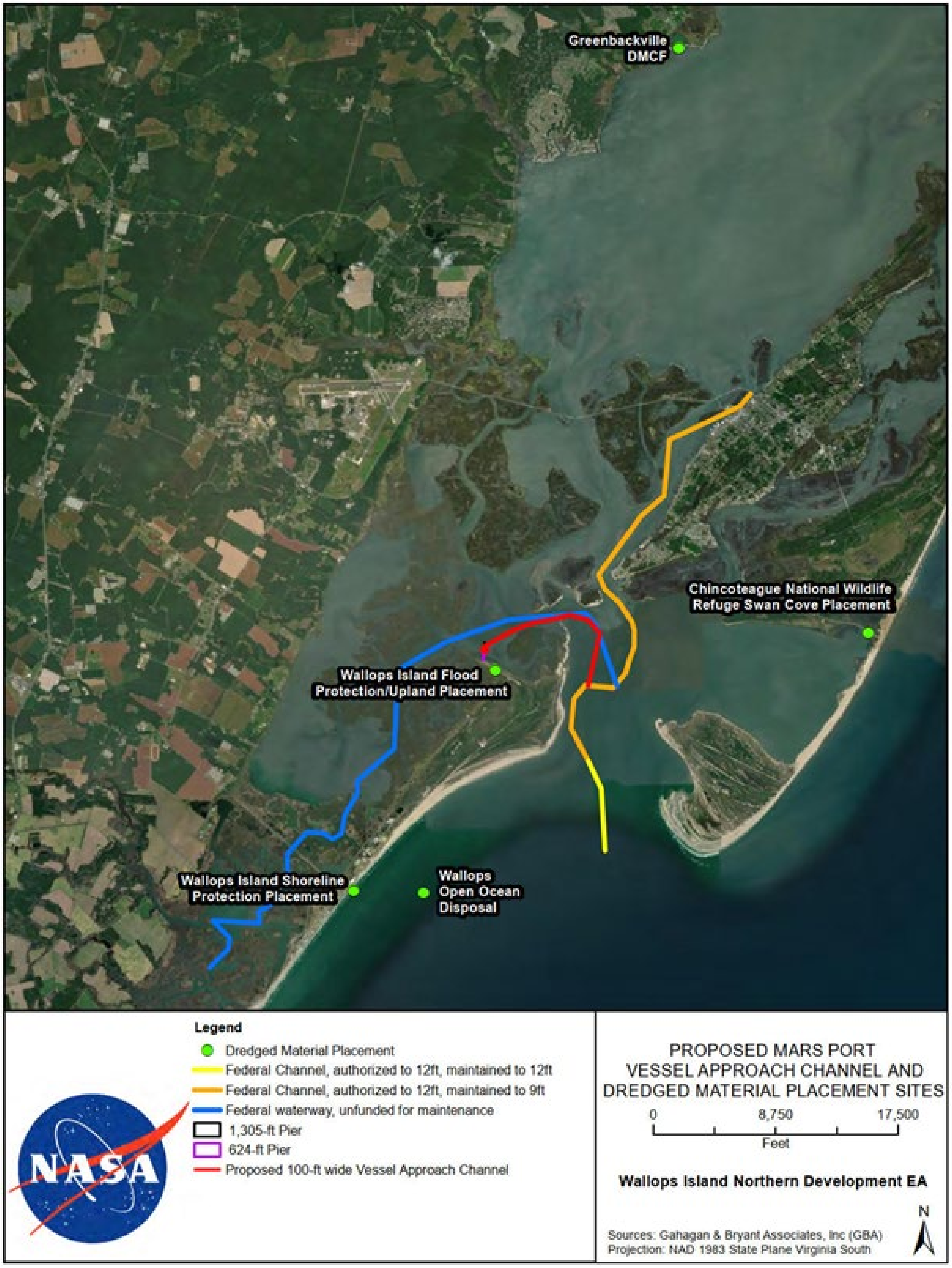

Figure 3: Proposed MARS Port Vessel Approach Channel and Dredged Material Placement Sites

Proposed Action In-Water Components

The MARS Port, including a 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. The in-water portion of the Proposed Action would also include the dredging of an existing channel for enhanced vessel approach purposes. The vessel approach channel would be approximately 12,800 ft long, 100 ft wide, and would have a final depth of 12 ft below MLLW. The MARS Port would provide a port and operations area along with associated capabilities for MARS, NASA WFF, and other customers. The MARS Port would also serve as a new part of the MARAD M-95 Marine Highway Corridor.

Construction of the Proposed Action would be carried out in three phases:

- **Phase 1** would be construction of a 624-ft fixed pier, a 200-ft-radius turning basin 9 ft deep below MLLW and dredging of the vessel approach channel to a final depth of 5 ft to 9 ft below MLLW (red outline in **Figure 4**). Additionally, a 130-ft long segment of the existing paved UAS Airstrip access road would be widened from 15 ft to 30 ft in conjunction with the widening of the culvert over which the road crosses a headwater drainage channel to Cow Gut.
- **Phase 2** would be construction of a 676-ft extension of the fixed pier to a total length of 1,305 ft and dredging of a 200-ft-radius turning basin (located at the end of the pier extension; shaded pink on **Figure 4**) to a final depth of 9 ft below MLLW.
- **Phase 3** of construction would be additional dredging of the turning basin and vessel approach channel to a final depth of 12 ft below MLLW, specifically the portion of the channel from the Phase 2 turning basin to where it meets the Chincoteague Inlet Federal Channel (shaded blue on **Figure 4**).

The portion of the channel shown in pink on **Figure 4**, which connects the vessel approach channel to the Phase 2 turning basin, is naturally deeper than 9 feet 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 2022 and being completed by 2024, with subsequent phases occurring approximately 1 to 2 years after the completion of the prior phase. Additional information about the proposed pier and other port components is provided in Chapter 2 of the Draft EA.

A variety of shallow-draft (2- to 4-ft), manned and unmanned vessels would be serviced by the Port. The major navigational service would be a tug and barge configuration of an approximately 150-ft by 40-ft deck barge propelled by a tugboat requiring approximately 8 ft of draft. The vessel approach channel would intersect with the Chincoteague Inlet Federal Channel and the Bogues Bay connecting waters (**Figure 3**). The proposed width of the approach channel, approximately 100 ft, is consistent with the dimensions of the Federal Channel. Estimated dredging volumes for the vessel approach channel and turning basin are provided in **Table 1**.

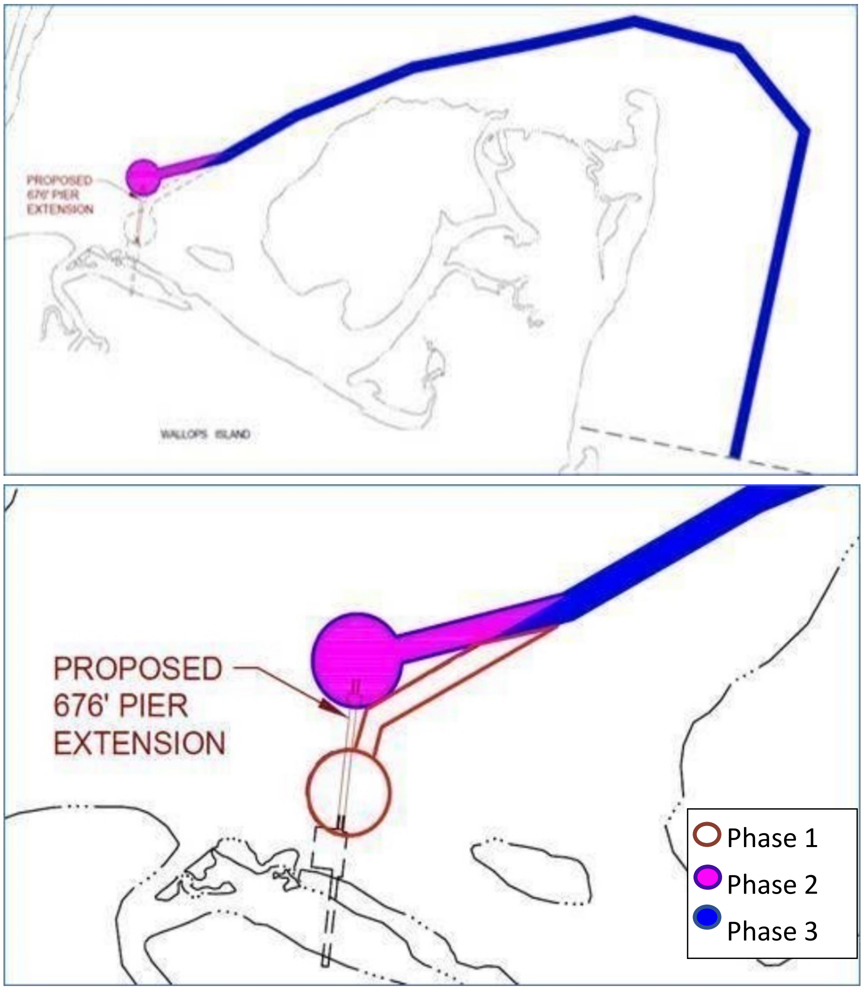

Figure 4: Diagram of Proposed Phased Construction

Table 1. Channel Dimensions and Estimated Dredging Volumes			
	Phase 1	**Phase 2**	**Phase 3**
Channel depth	9 ft deep below MLLW	9 ft deep below MLLW	12 ft deep below MLLW
Channel length	12,800 ft	11,800 ft	11,800 ft
Channel dredging volume	15,100 yd^3	0	34,600 yd^3
Turning basin dredging volume	40,500 yd^3	800 yd^3	3,200 yd^3
Total volume per phase	55,600 yd^3	800 yd^3	37,800 yd^3
		Total Volume (Phases 1–3):	**94,200 yd^3**

yd^3 = cubic yards

Five potential sites for the placement of dredged material are summarized in **Table 2** and shown on **Figure 3**. Currently, it is estimated that between 56,000 CY and 57,000 CY of material would be dredged during the initial dredging event. VCSFA intends to utilize Option 1, the Wallops Open Ocean Dredge Material Placement Area, as the initial dredge material placement site. When compared to Options 2 through 5, 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. The Open Ocean site is also the fastest path towards construction as it is already permitted by the USACE and has capacity for the proposed initial dredge material. While the Greenbackville DMCF (Option 3) is also already permitted by the USACE, it is not anticipated to have available capacity to handle the initial projected volume of material due to its expected use by USACE. Lastly, the dredged material is expected to be of similar physical and chemical characteristics as the material currently dredged from the Chincoteague Channel by the USACE. Dredged material placed within the Wallops Island nearshore zone is required to have the same physical characteristics (90%+ sand) as the natural bottom 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 compromised of approximately 95% sand and, therefore, would be suitable for the Open Ocean site.

For future maintenance dredging events, the Project may use Option 2, Wallops Island Flood Protection/Upland Placement. Keeping this as an option allows for future beneficial re-use of the dredge material on Wallops Island to provide resiliency to the MARS UAS Airfield. The cost of this option is higher as it would require additional studies, design, and construction to contain and shape the pumped discharge. Option 2 may also have impacts to the wetlands north of the UAS Airfield. Further analysis would be required for this impact and depending on the results, thin layer deposition or the use of geotubes could be required to hold the material. Lastly, the UAS Airfield is currently not permitted for material placement; the permitting process would require a longer timeframe than Option 1. If selected for placement during future maintenance dredging events, designs, impact analysis, and permitting would be required and would be performed at that time.

Table 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	Description
1	Wallops Open Ocean Dredge Material Placement Area	Open water placement site, closer than Lewis Creek or Norfolk Ocean disposal sites	6.1 mi	--	4.4 mi	--	This area is located just offshore of Wallops Island with a transportation distance of the dredged material of approximately 4 nautical mi. Open water placement options typically present the lowest cost dredging option and allows 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.
2	Wallops Island Flood Protection/ Upland Placement	Reuse of material for flood mitigation through upland placement at site identified by NASA	--	2,800 ft	--	12,040 ft	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 crossing 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.

Table 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	Description
3	Greenbackville Dredged Material Containment Facility (DMCF)	Upland DMCF run by USACE, requires both navigation of Chincoteague Channel and pumping on location	11.3 mi	--	9.5 mi	650 ft	The third dredged material placement option identified is the use of the upland Dredged Material Containment Facility (DMCF) owned and managed by the USACE. The USACE places material dredged from the upper reaches of the Chincoteague Channel into this DMCF. This option, which would require the USACE to first verify capacity and permit use of this site, would utilize a mechanical dredge to load the dredged material removed from the approach channel into barges. These barges would then be towed approximately 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. However, according to USACE, this site has limited capacity for material and may not be suitable.
4	Wallops Island Shoreline Protection Placement	Reuse of material for shoreline protection and beach repair	7.5 mi	--	6 mi	--	This option would involve the beneficial reuse of clean, compatible sand from the dredged material to repair and protect areas of the shoreline within the Launch Range area on Wallops Island. If dredged material is 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 such as hurricanes and Nor'easters. 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 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.

Table 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**	**Description**
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)	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 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 under sized 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. Once pumped, USFWS will assume responsibility for sediment placement and is in the process of securing appropriate permits.

[1] Sail distance = 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 (statute miles)
[2] Pipe distance = the length of pipe required to reach the placement site from the centroid of dredging or from the anchorage for a vessel loaded with dredged material
DMCF = Dredged Material Containment Facility

Proposed Action Onshore Components

Onshore facilities and infrastructure that would be constructed or upgraded under the Proposed Action are summarized in **Table 3**. Their proposed locations are shown on **Figure 2**. Improvements only apply to existing roads and utilities. No expansion beyond the proposed MARS Port and onshore facilities are anticipated at this time. Any future proposed changes would be addressed in additional NEPA documentation.

Table 3. Onshore Proposed Action Components

Facility or Element	Description
Project support building	A new, approximately 8,000-square foot (ft^2) building may be constructed on at 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 facility is removed or demolished the new facility may be constructed and would serve as a new North Island Operations Center. The new building would have a maximum height of 40 ft to avoid interference with a nearby air surveillance radar.
Second hangar	A new, approximately 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 client usage. The new hangar would have a maximum height of 40 ft to avoid interference with a nearby air surveillance radar. This proposed second, secure hangar would provide an additional area for MARS clients without hindering usage of the existing hangar for UAS Airfield operations.
Utility infrastructure	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), 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 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 proposed temporary holding tank where it would be periodically collected and pumped into the NASA wastewater system for treatment.

Table 3. Onshore Proposed Action Components

Facility or Element	Description
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 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 (culvert widening)	The existing 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 constriction and safety and operational hazards. A 130-ft segment of the existing paved access road would be widened from 15 ft to approximately 30 ft, and the culvert over which the road crosses a drainage channel to Cow Gut would also be widened.
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 100-ft-wide section of runway 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 along the north side of the existing UAS Airstrip (inside the drainage infiltration trench) from the intersection with the access road to the new MARS Port pier area.

Summary of Proposed Action Construction Activities

The Proposed Action would involve: (1) construction of the pier components that would make up the MARS Port; (2) dredging of the vessel approach channel, turning basin, and placement of dredged material; and (3) construction or improvement of the onshore facilities and infrastructure.

The estimated timeframe for construction of the Proposed Action would have Phase 1 beginning in 2022 and being completed by 2024, with subsequent phases occurring approximately 1 to 2 years after completion of the prior phase. 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). With two crews (10 persons each), working 5 days per week (10-hour days), construction of the 624-ft long pier under Phase 1 would take approximately 12 months to complete and construction of the 676-ft long pier extension under Phase 2 (for a total pier length 1,305 ft) would take approximately 9.5 months to complete.

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, tugboat, vibratory pile hammer, diesel impact hammer, concrete truck, concrete pump truck, concrete vibrator, generator, welding machines, cutting torches, and various small tools.

Summary of Proposed Action Operational Activities

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 fencing around the Revolutionary War Earthworks. During summer months, a mosquito fogging service truck sprays the airfield once every 2 weeks. The pier structure would also require quarterly structural inspections.

Potential facility usage associated with the MARS Port is provided in **Table 4**.

Table 4. 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 push boat	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 push boat	Potential for 12 launches per year; 3 trucks per launch	12	1
Venture Class 2 ELV	Shallow-draft deck barge & inland push boat	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 push boat	1 per Venture Class ELV launch	12	1

Table 4. Potential MARS Port Operations/Facility Usage

Potential Facility Usage	Vessel Type	Quantity Assumptions	Total Barge / Vessel Trips	Phase Associated with Usage
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
		Total Barge / Vessel Trips	**99**	

<u>Description of the Action Area</u>

The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR 402.02). For this project, the action area includes the north end of Wallops Island surrounding the UAS Airstrip – the onshore areas potentially affected by the construction of onshore facilities and their operation. It also includes the surrounding waters from Chincoteague Inlet to the east and north to Bogues Bay to the west – the offshore areas potentially affected by pier construction, channel and turning basin dredging, placement of dredged sediment, and vessels transiting between the proposed pier and the existing Chincoteague Inlet Federal Channel.

The onshore habitats within the action area on the north end of Wallops Island consist of forested uplands, maritime grasslands, non-tidal wetlands (emergent and scrub-shrub), and tidal wetlands. The dominant habitat within the area is tidal marsh that transitions into upland grass and maritime forest areas adjacent to the UAS airstrip. 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.

The offshore habitats within the action area include tidal marsh communities and the estuarine surface waters of Chincoteague Inlet, Bogues Bay, Ballast Narrows, and other waterways. The nearest beds of submerged aquatic vegetation are approximately 3 miles north of the project area. Waters in the project area contain public and private harvesting areas for shellfish (oysters and clams).

USFWS Listed Species in the Action Area and Effects Determination

The federally listed species under USFWS jurisdiction that were identified by USFWS as potentially occurring in the action area are described in the species conclusion table (**Table 5**). **Attachment 1** includes the USFWS consultation letter from the IPaC system that identified the species potentially occurring in the action area.

In 2019, USFWS issued a combined Biological Opinion (BO) for the Proposed and Ongoing Operations and Shoreline Restoration/Infrastructure Protection Program at WFF. 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. This plan outlines procedures for monitoring protected species that are likely to occur at Wallops Island including the northern long-eared bat, red knot, piping plover, and sea turtles. Monitoring reports for these species are prepared annually by WFF and submitted to the USFWS.

The species conclusion table (**Table 5**) provides the ESA Section 7 effects determination for each species (based on the analysis presented in the EA for the Wallops Island Northern Development). The determination of effects on these listed species is further discussed below.

Mammals

The northern long-eared bat is currently listed as threatened by the USFWS. In February 2016, the USFWS published a final 4(d) rule further defining “takes” and “incidental takes.” ESA 4(d) rules allow the USFWS the ability to provide more specific rules or measures to protect a species that is threatened (not endangered). The ESA 4(d) rule was passed due to the mortality faced by this species from white-nose syndrome, a fungal disease that is poorly understood at this time. Based on the final 4(d) rule and the absence of maternity roost trees or winter hibernacula on or near Wallops Island, the Proposed Action would have no effect on the northern long-eared bat.

Birds

Status of the Species in the Action Area

The red knot 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).

Table 5. Species Conclusions: Determination of Effects on Federally Listed Species under USFWS Jurisdiction

Common Name	Scientific Name	Status[1]	Habitat	Notes	ESA Section 7 Determination of Effect
Mammals					
Northern long-eared bat	*Myotis septentrionalis*	FT	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. Relying upon the findings of the 01/05/2016 Programmatic Biological Opinion for Final 4(d) Rule of the Northern Long-eared Bat and activities excepted from take prohibitions to fulfill project-specific Section 7 responsibilities. No maternity roost trees or winter hibernacula suitable for the species have been documented on or near Wallops Island (VDGIF 2020).	No effect
Birds					
Red knot	*Calidris canutus rufa*	FT	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). The Proposed Action would not occur on beaches or near red knot habitat.	May affect, not likely to adversely affect
Piping plover	*Charadrius melodus*	FT	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). The Proposed Action would not occur on beaches or near piping plover habitat (NASA 2019b).	May affect, not likely to adversely affect
Roseate tern	*Sterna dougallii dougallii*	FE	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).	No effect

Table 5. Species Conclusions: Determination of Effects on Federally Listed Species under USFWS Jurisdiction

Common Name	Scientific Name	Status[1]	Habitat	Notes	ESA Section 7 Determination of Effect
Eastern black rail	*Laterallus jamaicensis jamaicensis*	FT	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, species surveys conducted in June 2021, did not detect a call response in the action area. Through informal conference with USFWS conducted on 8/16/2019 and subsequent informal consultation, avoidance and minimization measures to be implemented by NASA, VCSFA, and their contractors during construction were identified.	May affect, not likely to adversely affect
Reptiles					
Loggerhead sea turtle	*Caretta caretta*	FT	Coastal and offshore ocean waters; nests on 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 2019). Proposed Action unlikely to affect species; construction activity not located in nesting habitat. Due to the transient presence of the species, dredging operations are unlikely to affect the loggerhead sea turtle. Potential occurrence in action area: adults and juveniles migrating and foraging May–November (NOAA Fisheries 2020).	No effect on nesting turtles
Leatherback sea turtle	*Dermochelys coriacea*	FE	Coastal and offshore ocean waters; nests on beaches	Nesting in the action area is unlikely; only one individual demonstrating nesting behavior documented on Assateague Island in 1996. Generally considered oceanic; however, will forage in coastal areas if prey species are available in high densities (NASA 2019). Potential occurrence in action area: adults and juveniles migrating and foraging May–November (NOAA Fisheries 2020).	No effect on nesting turtles
Hawksbill sea turtle	*Eretmochelys imbricata*	FE	Coastal ocean waters; nests on beaches	Unlikely to occur in or near the action area; only two observations in Virginia since 1979 (NASA 2019).	No effect on nesting turtles

Table 5. Species Conclusions: Determination of Effects on Federally Listed Species under USFWS Jurisdiction

Common Name	Scientific Name	Status[1]	Habitat	Notes	ESA Section 7 Determination of Effect
Kemp's ridley sea turtle	*Lepidochelys kempii*	FE	Coastal ocean waters; nests on beaches	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). Generally occurs in more sheltered, shallower water habitats than other sea turtle species (NASA 2019). Potential occurrence in action area: adults and juveniles migrating and foraging May–November (NOAA Fisheries 2020).	No effect on nesting turtles
Green sea turtle	*Chelonia mydas*	FT	Coastal ocean waters; nests on beaches	Nesting unlikely; only one documented nest in Virginia -- at Virginia Beach in 2005 (NASA 2019a). Potential occurrence in action area: adults and juveniles migrating and foraging from May–November (NOAA Fisheries 2020).	No effect on nesting turtles
Flowering Plants					
Seabeach amaranth	*Amaranthus pumilus*	FT	Area seaward of primary dunes	Species has not been documented at WFF since monitoring began in 2010 (NASA 2019b); nearest documented occurrence is on Assateague Island (NASA 2019a). No primary dunes or beaches in the project limits; therefore, no suitable habitat present.	No effect
Insects					
Monarch butterfly	*Danaus plexippus*	C	Breeding – meadows and weedy fields with milkweed; migration – vegetation anywhere	Breeds throughout eastern North America where milkweed species occur. Winters in Mexico. Migrates between these areas annually (USFWS 2020). Minimal potential for milkweed in action area. May transit the area during migration.	No effect

[1] FE = federally listed as endangered; FT = federally listed as threatened; C = candidate for listing
Sources: Species and status -- USFWS (2020); habitat and notes -- NASA (2019) unless otherwise noted

In 2019, over 2,000 red knots were observed on the north end of Wallops Island (NASA 2019b) which most likely due to construction activities of the WFF Shoreline Restoration Project decreased to 117 individuals in 2020 (NASA 2020a). There are no beaches on the northwestern side of Wallops Island where onshore components of the Proposed Action would be implemented; however, narrow beaches do exist along the eastern side of the island adjacent to offshore areas where dredging for portions of the proposed vessel approach channel would occur.

The piping plover 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 the nearby Chincoteague National Wildlife Refuge. Piping plover nests have been documented on coastal beaches along the northeastern side of Wallops Island (**Figure 5**). Suitable habitat for the species is not present in areas where onshore components of the Proposed Action would be implemented.

The eastern black rail 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, a habitat survey was requested by USFWS to identify whether an eastern black rail survey would be needed.

A habitat assessment was conducted in July-August 2020 (NASA 2020b), and a follow-up species presence survey was performed in June 2021 (NASA 2021). The survey was performed in accordance with the Maryland Protocol (Wilson 2015; Gibbs and Melvin 1993), and in any situations where the Maryland Protocol did not specify a condition, the Standardized North American Marsh Bird Monitoring Protocol (SNAMBMP; Conway 2011). The methodology used for these surveys consisted of three broadcast playback field survey efforts between May 1 and July 15, conducted at the two survey stations. Surveys were not conducted in rain, fog, or when wind speeds exceeded 12 mph. These surveys were conducted as close to a half hour after sunset as possible to maintain consistency with the Maryland Protocol. Tidal conditions are not defined in the Maryland Protocol, but the SNAMBMP recommends similar tidal levels for all survey events. To maintain consistency with tidal conditions, all surveys were conducted at tide levels within approximately 1 foot of each other; the tide level at approximately 21:00 on the three dates was approximately 2 feet high and rising on June 15, 2021 and June 29, 2021 and approximately 3 feet high and receding on June 22, 2021. Eastern black rails were not detected at either survey station within (or outside) the 400-meter radii on any of the three survey nights; however, clapper rails were present and vocal for most of the surveys.

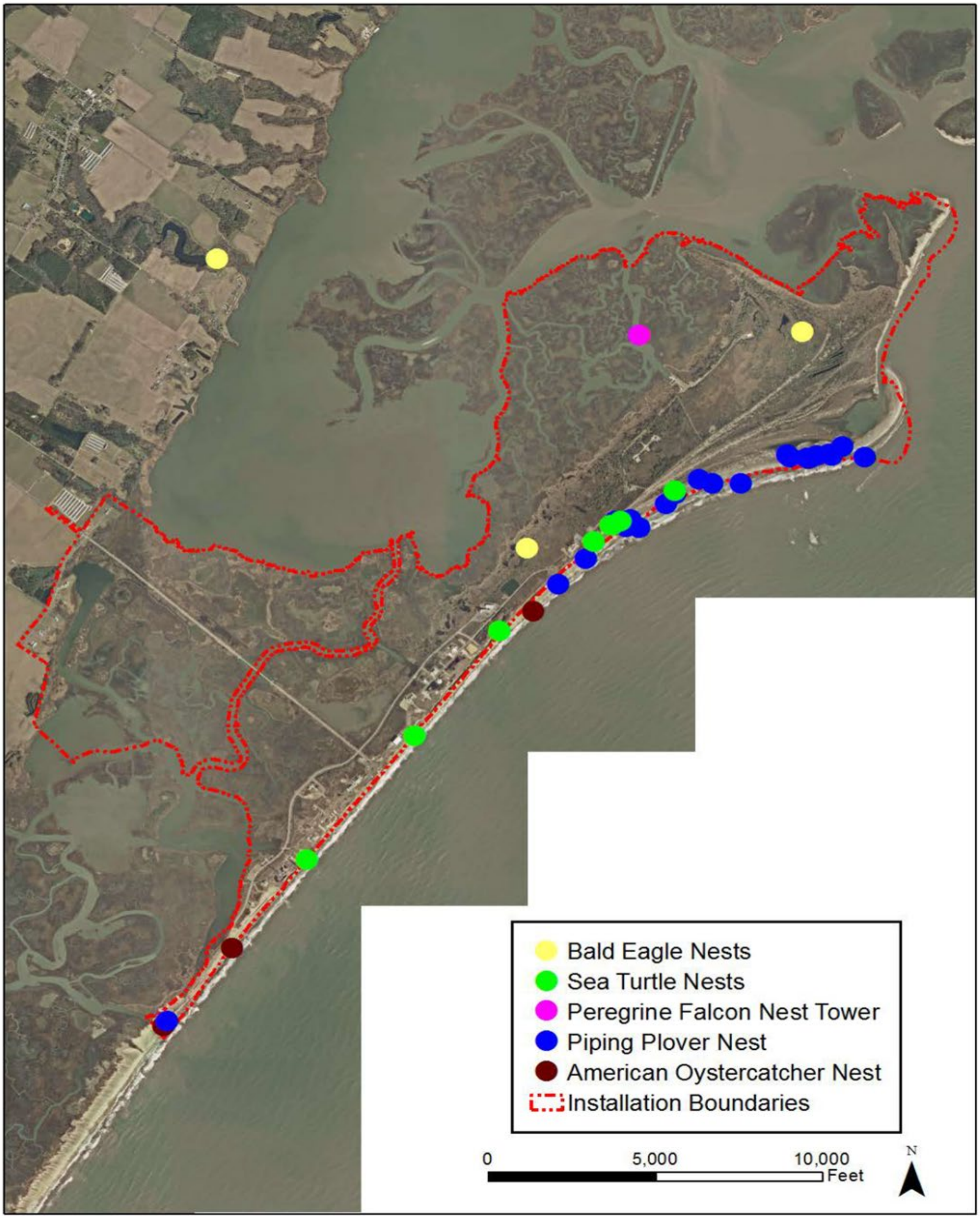

Figure 5. Historic Nesting Sites for Federally Listed and Other Special-Status Species at WFF Wallops Island and Mainland

Effects Determination

The roseate tern occurs offshore and is rarely observed along the U.S. coast south of New Jersey; therefore, the Proposed Action would have no effect on the roseate tern.

Construction of the Proposed Action would have the potential to disturb the red knot, piping plover, and eastern black rail if present in or near the action area due to stressors such as noise, increased human presence, and removal of vegetation potentially providing habitat. Airborne noise can be roughly estimated by assuming the construction equipment required and providing a distance to a noise sensitive receptor. For the replacement of the causeway bridge at the south end of Wallops Island, the noise from piling driving was estimated at 101 dBA at 50 ft (NASA 2019a). In its Programmatic Biological Opinion on the WFF Shoreline Restoration and Infrastructure Protection Program (NASA 2010), USFWS set protected species monitoring requirements at the 100 dB contours from a rocket launch (NASA 2019a). The nearest recorded nesting location for a federally listed avian species (i.e., piping plover) would be greater than 6,000 ft from pile-driving activities under the Proposed Action; thus, no airborne noise impacts are anticipated to the red knot or piping plover.

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 for these species near the areas where these activities would occur is absent or minimal. Also, birds are highly mobile and could avoid these areas during project activities.

Construction activities of the Proposed Action may affect but are not likely to adversely 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 could utilize as habitat the salt marsh where the proposed pier would be installed. The area of habitat that would be affected would be very small compared to the extensive marsh habitat in adjacent areas. NASA anticipates a primary Area of Potential Effect (APE) within a 50-ft buffer around onshore and nearshore construction activities of the pier. Beyond the 50-ft buffer (or Primary APE), and through the informal conference process with USFWS, a conservative estimate for a preliminary secondary APE has been established to account for potential effects from light, noise, and hydrology changes from the Proposed Action. Noise from construction equipment would likely to be intermittent and temporary. Based on the typical noise from roadway construction equipment, attenuation results in a drop-off rate of 7.5 decibels A-weighted (dBA) per doubling of distance for a point source. The noise emission levels at 50 feet from the point source for pile driving, scraping, paving, and concrete mixing typically range from 80 to 95 dBA. Assuming the maximum noise from construction of 95 dBA, a nuisance level of 73 dBA and above, combined with the estimated 7.5 dBA attenuation, a conservative potential APE is noted with a 400-ft buffer from the Project Area or noise source (California Department of Transportation 2016).

Noise minimization strategies implemented to the extent practicable during construction may include: temporary noise barriers or sound walls, noise pads or dampers, movable task noise barriers, queuing trucks to distribute idling noise, locating vehicle access points and loading and shipping facilities away from habitat areas, reducing the number of noisy activities that occur simultaneously, relocating stationary equipment away from habitat areas, and use of vibration reducing modifications to construction equipment. Implementing these practices would minimize potential effects on the eastern black rail. Therefore, NASA has determined that the construction of the Proposed Action may affect but is not likely to adversely affect the eastern black rail.

Activities associated with the operation of the proposed port would be like other commercial boating activities occurring with relative frequency in and around the action area. Such activities 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 red knot, piping plover, and eastern black rail would be insignificant or discountable. Accordingly, the Proposed Action may affect but is not likely to be adversely affect these bird species. It would have no effect on the roseate tern.

Sea Turtles

Status of the Species

For management purposes, the loggerhead sea turtle population is organized into nine distinct population segments (DPS), four that are listed as threatened and five that are listed as 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. 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 (NASA 2017). The closest nest to the Project Area was approximately 1.3 mi south of the UAS Airstrip (**Figure 5**). Suitable loggerhead nesting habitat is not present in onshore areas where components of the Proposed Action would be implemented.

The leatherback sea turtle is federally and state listed as endangered. It is the largest sea turtle and largest reptile species, reaching up to 6.5 ft in length and weighing up to 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 in tropical waters. Leatherbacks have never been sighted at WFF but are known to occur in the waters offshore of Accomack County (NASA 2017).

The hawksbill sea turtle is federally and state listed as endangered. It can reach up to 3 ft in length and weigh up to 180 lbs. Hawksbills typically nest high up on 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 directly observed at WFF (NASA 2017). They may occur in offshore waters, but their preferred tropical habitat is not present at or near WFF.

The Kemp's ridley sea turtle is federally and state listed as endangered. It is the smallest of all sea turtles, growing to 28 inches long and weighing up to 100 lbs. The species' range includes the Atlantic coastline from Maine to Florida, and the Gulf of Mexico. It is 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. The Kemp's ridley sea turtle has never been directly observed at WFF but may occur offshore in shallow waters with depths less than 160 ft (NOAA Fisheries 2016).

The green sea turtle is federally and state listed as threatened. This species is the largest of all the hard-shelled marine turtles, growing to a length of 3 ft and weighing up to 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 been observed in waters off WFF and are likely to inhabit the waters off WFF during the warmer months when sea grasses and algae are plentiful (NASA 2017).

Effects Determination

Terrestrial impacts from construction activities are unlikely to adversely affect sea turtle nests due to the lack of nesting sites within the action area. Loggerhead sea turtle nesting sites have been found on Wallops Island beaches outside of the action area (**Figure 5**) but were last observed in 2013. 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, but none have been found nesting near the action area. Due to the lack of nesting habitat in the action area, the proposed action would have no effect on nesting sea turtles.

Flowering Plants

Seabeach amaranth has not been documented at WFF. Its habitat is the area seaward of primary dunes, but there are no primary dunes or beaches in the action area. Therefore, suitable habitat is not present, and the Proposed Action would have no effect on seabeach amaranth.

Insects

The monarch butterfly was designated by the USFWS in December 2020 as a candidate species for listing as threatened or endangered; its status will be reviewed each year. The monarch is dependent on milkweeds for breeding habitat because they are the only food source for monarch caterpillars. The action area is unlikely to provide habitat for milkweeds. During migration, monarchs may occur in vegetated areas anywhere and may utilize a wide variety of nectar-producing flowers for food. Thus, they could transit through the action area during migration.

Approximately 1.1 ac of upland vegetation would be lost due to the Proposed Action. Extensive vegetation would remain around the airstrip and in other areas of NASA WFF as well as nearby National Wildlife Refuges maintained by USFWS. 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 potentially providing habitat for the monarch butterfly would be minor, and the potential for impacts on the monarch butterfly would be negligible.

Best Management Practices Summary

The construction contractor would use erosion and sediment control measures in upland areas to minimize or prevent the erosion of exposed soils by wind and water and corresponding sedimentation of receiving water bodies. Accidental spills of fuel or other hazardous substances would be prevented or minimized through the contractor's adherence to the spill prevention and control measures as specified in the WFF's *Integrated Contingency Plan.* Vegetation removed in areas impacted for construction access would be replaced in accordance with the NASA WFF vegetation management policies. Construction techniques such as vibratory dampening would be used to reduce equipment vibration, and adherence to lighting best practices would be used to minimize the duration and intensity of lighting.

The intensity and duration of construction activity and the areas disturbed would vary throughout the Proposed Action's construction phases, resulting in corresponding variations in the intensity and duration of short-term impacts. The phased implementation of the Proposed Action would distribute potential impacts on listed species over multiple years, thereby minimizing impacts by ensuring that not all impacts 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 erosion control measures, noise and vibration reduction measures, and minimization of lighting frequency and/or duration in work areas to the extent practicable while maintaining safe working conditions.

Conclusions

NASA requests your agency's concurrence with our determination of effects for each of the federally listed species under USFWS jurisdiction potentially occurring in the action area, as summarized in **Table 5**.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Sincerely,

Shari A. Miller

Shari A. Miller
Center NEPA Manager and
Environmental Planning Lead

Enclosures
Attachment 1, USFWS Consultation Letter/Species List

cc:
250/Ms. K. Finch
250/Mr. T. Meyer
MARAD/Mr. A. Finio
USACE/Mr. B. Denson
VCSFA/Mr. N. Overby

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ATTACHMENT 1: Information for Planning and Consultation (IPAC)
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United States Department of the Interior

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Gloucester, VA 23061-4410
Phone: (804) 693-6694 Fax: (804) 693-9032
http://www.fws.gov/northeast/virginiafield/

In Reply Refer To: December 28, 2020
Consultation Code: 05E2VA00-2021-SLI-1294
Event Code: 05E2VA00-2021-E-03713
Project Name: Wallops Island Northern Development

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq*.). Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq*.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
(804) 693-6694

Project Summary

Consultation Code: 05E2VA00-2021-SLI-1294

Event Code: 05E2VA00-2021-E-03713

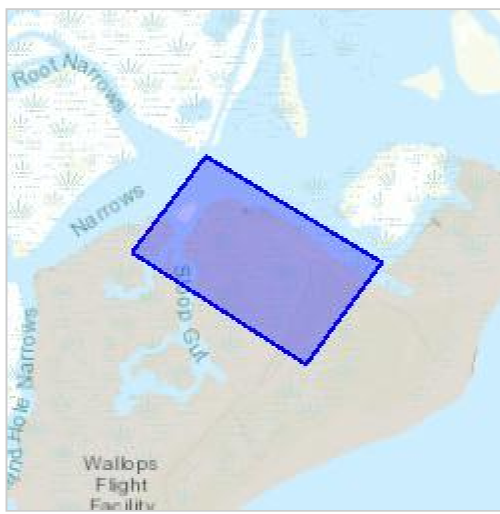
Project Name: Wallops Island Northern Development

Project Type: DEVELOPMENT

Project Description: Construction and operation of a pier/port, with construction of associated buildings near the NASA unmanned aerial systems (UAS) airstrip and offshore dredging of channels and turning basins.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/37.88564155082318N75.4428012803902W



Counties: Accomack, VA

Endangered Species Act Species

There is a total of 11 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Birds

NAME	STATUS
Eastern Black Rail *Laterallus jamaicensis ssp. jamaicensis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10477	Threatened
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Roseate Tern *Sterna dougallii dougallii* Population: Northeast U.S. nesting population No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2083	Endangered

Reptiles

NAME	STATUS
Green Sea Turtle *Chelonia mydas* Population: North Atlantic DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6199	Threatened
Hawksbill Sea Turtle *Eretmochelys imbricata* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3656	Endangered
Kemp's Ridley Sea Turtle *Lepidochelys kempii* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5523	Endangered
Leatherback Sea Turtle *Dermochelys coriacea* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1493	Endangered
Loggerhead Sea Turtle *Caretta caretta* Population: Northwest Atlantic Ocean DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1110	Threatened

Flowering Plants

NAME	STATUS
Seabeach Amaranth *Amaranthus pumilus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8549	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

REFUGE INFORMATION WAS NOT AVAILABLE WHEN THIS SPECIES LIST WAS GENERATED. PLEASE CONTACT THE FIELD OFFICE FOR FURTHER INFORMATION.

From:	Miller, Shari A. (WFF-2500) <shari.a.miller@nasa.gov>
Sent:	Wednesday, November 10, 2021 1:38 PM
To:	Martin, Amy; Argo, Emily; Ruth Boettcher
Cc:	Levine, Lori M. (GSFC-2500); Nate Overby; Finio, Alan (MARAD); brian.c.denson@usace.army.mil; Meyer, T J (WFF-2500); Finch, Kimberly (GSFC-2500)
Subject:	Eastern Black Rail Survey for Wallops Island Northern Development, NASA WFF
Attachments:	313-382_NASA Wallops Island BLRA_Survey_Letter_Final.pdf
Follow Up Flag:	Follow up
Flag Status:	Flagged

Emily, Ruth, Amy,

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) propose to construct a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel. NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Endangered Species Act (ESA) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfil their requirements.

NASA contracted AECOM to conduct a breeding survey for eastern black rails (*Laterallus jamaicensis jamaicensis*). Three iterations of marsh bird surveys were conducted on the evenings of June 15, 2021, June 22, 2021, and June 29, 2021. The surveys occurred at two (2) survey stations in the vicinity of an existing unmanned aerial systems airstrip. Eastern black rails were not detected at either survey station within (or outside) the 400-meter (0.25-mile) radii on any of the 3 survey nights; however, clapper rails (CLRA) were present and
vocal for most of the surveys.

The report of the survey is attached for your review and comment. If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Thank you.

Shari A. Miller
Center NEPA Manager &
Natural Resources Manager
NASA GSFC Wallops Flight Facility
Wallops Island, VA 23337
(757) 824-2327
Shari.A.Miller@nasa.gov
https://code200-external.gsfc.nasa.gov/250-wff/

"Remember there's no such thing as a small act of kindness. Every act creates a ripple with no logical end." —Scott Adams

August 5, 2021

Ms. Shari Miller
Center NEPA Manager and Natural Resource Manager
NASA GSFC Wallops Flight Facility
Wallops Island, VA 23337

Dear Ms. Miller:

Subject: NASA Wallops Island Eastern Black Rail Survey
Wallops Island, Accomack County, Virginia
CEC Project 313-382

1.0 INTRODUCTION

Tommy Goodwin, PE (CEC) and Christian Knatt (AECOM) conducted three iterations of marsh bird surveys on the evenings of June 15, 2021, June 22, 2021, and June 29, 2021 for the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center's Wallops Flight Facility (WFF) Wallops Island Northern Development Project in Wallops Island, Accomack County, Virginia. The purpose of the study was to conduct a breeding survey for eastern black rails (*Laterallus jamaicensis jamaicensis).* The surveys occurred at two (2) survey stations in the vicinity of an existing unmanned aerial systems airstrip (Figure 1). The survey stations were designated by AECOM in their habitat assessment for this project (AECOM 2020). The approximate center of the project area is located at 37.885818 °N, -75.436997 °W.

2.0 BACKGROUND

Black rails are a very small species of rail described by a slate gray/black body with a chestnut colored nape and thin white spotting on the rump and flanks; the bill is blueish gray and the eyes are bright red. Black rails are the smallest rail species in North America, measuring 10 to 15 centimeters (4 to 6 inches) in length and have a mean mass of approximately 35 grams (1.2 ounces), approximately the size of a deer mouse (Eddleman 2020). Eastern black rails, the subspecies found along the Atlantic coast and the largest subspecies of black rail, do not have a substantially different habitat or behavior from the other subspecies of black rail. Due to the size of black rails, their habitat tolerance is very narrow; they rely on high marshes which only flood in severe weather, but are consistently at least moist. Black rails need wet soils, but cannot tolerate more than 3 centimeters (1.2 inches) of water depth (Flores 1995). Black rails are typically found in high marsh areas abundant in species including cordgrasses (ie. *Spartina patens, S. alterniflora, S. cynosuroides,* and *S. bakeri*), pickleweeds (*Salicornia spp.*), saltgrass (*Distichlis spicata*), black rush (*Juncus gerardi*), needlerush (*Juncus roemerianus*), or Olney bulrush (*Scirpus olneyi*). This habitat is more saturated than that which common reed (*Phragmites australis*) begins to dominate (Flores 1995; D. Brinkler, Maryland Department of Natural Resources (MDDNR) June 29, 2021, personal communication).

Prior to the mid 1990's, eastern black rails were one of the most abundant species/subspecies of rail in the Delmarva Peninsula, only outnumbered by Virginia rail and clapper rail (D. Brinkler, MDDNR June 29, 2021, personal communication). Due to rising sea levels, the high marshes along the Atlantic coast flood more frequently and have been transitioning to low marsh while upland habitats are unable to transition to high marsh habitat at a similar rate either due to geographical/geological restrictions or established flora that will take time to change (Watts 2016).

Like most rail species, black rails are primarily nocturnal callers and typically only fly when in distress, preferring to walk between the stems of flora in their environment; this makes observing this secretive species a challenging endeavor. No observations of eastern black rail have occurred during federal or state agency surveys in Maryland or Virginia since prior to 2019 (D. Brinkler, MDDNR June 29, 2021, personal communication). Every state along the Atlantic coast has also seen drastic reductions to eastern black rail populations leading to the eastern black rails obtaining federal protection on November 9, 2020 (USFWS 2020).

3.0 SURVEY STATIONS

Locations of the two (2) survey stations were determined by AECOM based on the findings in their Habitat Assessment for the WFF (AECOM 2020). These stations were located such that all high marsh habitat within 122 meters (400 feet) of the proposed buildings and runway expansion was included within a 400-meter (0.25-mile) radius survey area from the survey stations (Figure 1). According to AECOM (2020), a total of 8.9 hectares (22 acres) of high marsh habitat consisting primarily of saltmeadow hay (cordgrass; *Spartina patens)* and other high marsh flora exists within the survey station 400-meter (0.25-mile) radii. The two survey stations were positioned such that double counting of any rails would not be likely to occur.

4.0 METHODS

The survey was performed in accordance with the Maryland Protocol (Wilson 2015; Gibbs and Melvin 1993), and, in any situations where the Maryland Protocol did not specify a condition, the Standardized North American Marsh Bird Monitoring Protocol (SNAMBMP; Conway 2011) was followed.

The methodology used for these surveys consisted of 3 broadcast playback field survey efforts, between the first of May (May 1) and the fifteenth of July (July 15), conducted at the 2 survey stations. Surveys were not conducted in rain, fog, or when wind speeds exceeded 19.3 kilometers per hour (12 miles per hour). These surveys were conducted as close to 0.5-hour after sunset as possible to maintain consistency with the Maryland Protocol. Tidal conditions are not defined in the Maryland Protocol, but the SNAMBMP recommends similar tidal levels for all survey events.

Due to the nature of the secretive marsh birds, auditory surveys are the most effective method for identifying eastern black rails. In accordance with the Maryland Protocol, broadcast playback surveys were conducted at each survey station for 10 minutes with a call sequence as follows:

- 2 minutes of silence;
- 4 minutes of eastern black rail calls (ki-ki-ker, growls, ki-ki doo);
- 1 minute of silence;
- 2 minutes Virginia rail calls; and
- 1 minute of silence.

5.0 RESULTS

Eastern black rails were not detected at either survey station within (or outside) the 400-meter (0.25-mile) radii on any of the 3 survey nights; however, clapper rails (CLRA) were present and vocal for most of the surveys. Delays, of approximately 0.5 hour, were experienced due to runway access and excessive wind speed on the second and third surveys. To maintain consistency with tidal conditions, all surveys were conducted at tide levels within approximately 0.3 meter (1 foot) of each other; the tide level at approximately 21:00 on the 3 dates was approximately 0.6 meter (2 feet) high and rising on June 15, 2021 and June 29, 2021 and approximately 0.9 meter (3 feet) high and receding on June 22, 2021. A summary of the results of the surveys can be found in Table 1.

Table 1: Summary of Wallops Island Marsh Bird Surveys

Date	Time	Survey Station	Species	Individuals
June 15, 2021	21:00	1	CLRA	1
	21:20	2	None	0
June 22, 2021	21:30	1	CLRA	4
	21:45	2	CLRA	1
June 29, 2021	21:25	1	CLRA	1
	21:50	2	None	0

Data collection included survey station, date, time, weather conditions, ambient noise levels, any marsh bird vocalizations, and approximate distance/direction of detected birds from observers. Field forms were adapted from the SNAMBMP and are included as Attachment 1.

Sincerely,
CIVIL & ENVIRONMENTAL CONSULTANTS, INC.

Tommy J. Goodwin, Jr., PE
Project Consultant

Ryan A. Slack
Principal

Enclosures: References
Figure 1: Eastern Black Rail Survey Map
Attachment 1: Scanned Field Forms

REFERENCES

AECOM. 2020. Eastern Black Rail (*Laterallus jamaicensis jamaicensis)* Habitat Assessment. NASA Wallops Flight Facility. 15pp.

Conway, C. J. 2011. Standardized North American Marsh Bird Monitoring Protocol. Waterbirds. 34(3). 319-346pp.

Eddleman, W. R., R. E. Flores, and M. Legare (2020). Black Rail (Laterallus jamaicensis), version 1.0. In Birds of the World (A. F. Poole and F. B. Gill, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA.

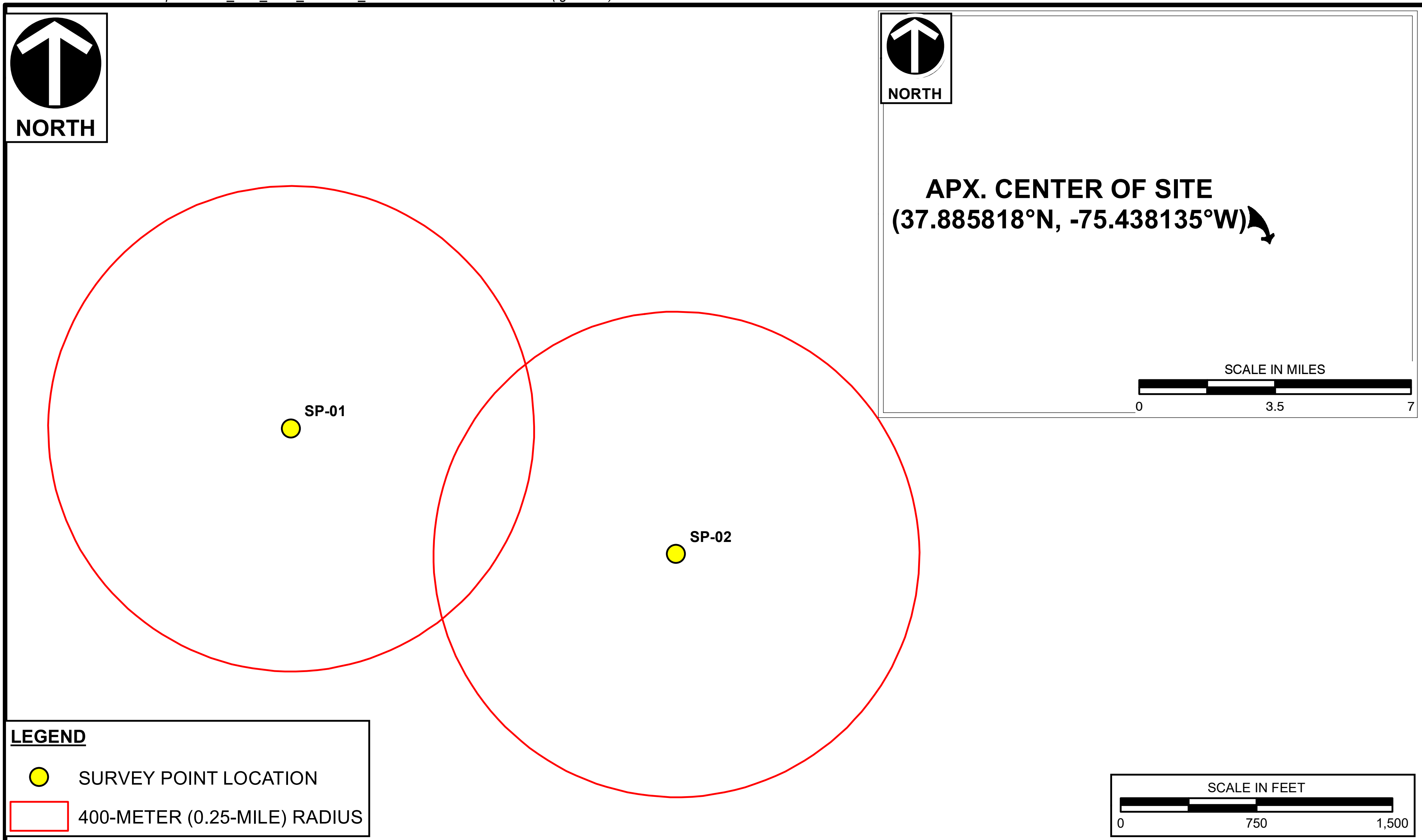
Flores, R. E. and W. R. Eddleman. (1995). California Black Rail use of habitat in southwestern Arizona. Journal of Wildlife Management 59.

Gibbs, J. P. and S. M. Melvin. 1993. Call-response Surveys for Monitoring Breeding Waterbirds. Journal of Wildlife Management 57: 27–34pp.

US Fish and Wildlife Service. 2020. Endangered and Threatened Wildlife and Plants; Threatened Species Status for Eastern Black Rail with a Section 4(d) Rule. 50 CFR Part 17. Federal Registrar. Vol. 85, No. 196. 63764-63803pp.

Watts, B. D. 2016. Status and distribution of the eastern black rail along the Atlantic and Gulf Coasts of North America. The Center for Conservation Biology Technical Report Series, CCBTR-16-09. College of William and Mary/Virginia Commonwealth University, Williamsburg, VA. 148 pp.

Wilson, M. D., F. M. Smith, and B. D. Watts. 2015. Re-survey and Population Status Update of the Black Rail in Virginia. Center for Conservation Biology Technical Report Series, CCBTR-15-004. College of William and Mary and Virginia Commonwealth University. Williamsburg, VA. 15pp.



REFERENCE

ESRI WORLD IMAGERY / ARCGIS MAP SERVICE: HTTP://GOTO.ARCGISONLINE.COM/MAPS/WORLD_IMAGERY, ACCESSED 8/4/2021,

USGS TOPOGRAPHIC MAP/ ARCGIS MAP SERVICE: HTTP://GOTO.ARCGISONLINE.COM/MAPS/USA_TOPO_MAPS, ACCESSED 8/4/2021

[redacted]

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NATIONAL AERONAUTICS AND SPACE AGENCY
WALLOPS ISLAND FACILITY
WALLOPS ISLAND, ACCOMACK COUNTY, VIRGINIA

EASTERN BLACK RAIL SURVEY MAP

DRAWN BY:	TJG	CHECKED BY:	SRD	APPROVED BY:	RAS	FIGURE NO:	1
DATE:	8/4/2021	SCALE:	1 " = 750 '	PROJECT NO:	313-382.0001	* Hand signature on file	

National Marsh Bird Monitoring Program Survey Data Sheet

Date: 6/15/2021 **Location:** Wallops Island

Route: ~~NASA~~ Wallops Island, VA

Observer(s): T Goodwin / C Kraft

Instructor

Survey replicate # : 1

	Before/After
Temperature *(°F)* :	75 / 73
Wind speed *(mph)* :	1-3 / 1-3
Cloud cover *(%)* :	1 / 1
Precipitation *(see below)* :	none / none

Total # during survey			
PBGR		VIRA	
LEBI		CLRA	
AMBI		COGA	
BLRA		SORA	
AMCO		clea	1

**list all observers in order of their contribution to the data collected*

put an "S" in the appropriate column if the bird was seen, a "1" if the bird was heard, and "1S" if both heard and seen

Station#	Start Time (military)	Background noise	Species	Before	Pass 0-1	Pass 1-2	BLRA 2-3	BLRA 3-4	BLRA 4-5	BLRA 5-6	Pass 6-7	VIRA 7-9	Pass 9-10	After	Call Type(s)	Direction	Distance (meters)	Detected at a Previous Point	Comments
				Responded During:															
1	~~2057~~ 2100	0	CLRA									1			Kek		200		
2	2120	1	—																No Birds

Call Types: BLRA: *kicky-doo, grr, churt* RIRA: cltr, kburr, kek, khurrah LEBI: *coo, kak, ert* VIRA: *grunt, ticket, kicker*
SORA: whinny, perweep, keep PBGR: owhoop, hyena COGA: wpt, beep AMCO: burup, honk, hicup AMBI: pump-er-lunk

If the call type is not one of the above listed types, describe the call in the comments column

Precipitation: light rain, rain, heavy rain, light snow, snow, heavy snow, fog, none

Background noise: 0 *no noise* 1 *faint noise* 2 *moderate noise (probably can't hear some birds beyond 100m)*
3 *loud noise (probably can't hear some birds beyond 50m)* 4 *intense noise (probably can't hear some birds beyond 25m)*

National Marsh Bird Monitoring Program Survey Data Sheet

Date: 6/22/21 **Location:** WALLOPS ISLAND **Before/After**

Route: Wallops Island, VA **Temperature** *(°F)*: 68 / 68

Observer(s): T Goodwin / C Knott **Wind speed** *(mph)*: 5 / 5

Instructor **Cloud cover** *(%)*: 90 / 90

Survey replicate #: 2 **Precipitation** *(see below)*: none / none

Total # during survey			
PBGR		VIRA	
LEBI		CLRA	
AMBI		COGA	
BLRA		SORA	
AMCO		CLRA	5

**list all observers in order of their contribution to the data collected*

put an "S" in the appropriate column if the bird was seen, a "1" if the bird was heard, and "1S" if both heard and seen

Station#	Start Time (military)	Background noise	Species	Responded During: Before	Pass 0-1	Pass 1-2	BLRA 2-3	BLRA 3-4	BLRA 4-5	BLRA 5-6	Pass 6-7	VIRA 7-9	Pass 9-10	After	Call Type(s)	Direction	Distance (meters)	Detected at a Previous Point	Comments
1	2130	1	CLRA	1		1	1	1	1	1					Kek		300		
			CLRA			1						1					300		
			CLRA									1					350		
			CLRA										1				50		
2	2145	1	CLRA										1	1(2)			15		

Call Types: BLRA: *kicky-doo, grr, churt* RIRA: cltr, kburr, kek, khurrah LEBI: *coo, kak, ert* VIRA: *grunt, ticket, kicker*
SORA: whinny, perweep, keep PBGR: owhoop, hyena COGA: wpt, beep AMCO: burup, honk, hicup AMBI: pump-er-lunk

If the call type is not one of the above listed types, describe the call in the comments column

Precipitation: light rain, rain, heavy rain, light snow, snow, heavy snow, fog, none

Background noise: 0 *no noise* 1 *faint noise* 2 *moderate noise (probably can't hear some birds beyond 100m)*
3 *loud noise (probably can't hear some birds beyond 50m)* 4 *intense noise (probably can't hear some birds beyond 25m)*

National Marsh Bird Monitoring Program Survey Data Sheet

Date: 6/29/2021 **Location:** Wallops Island **Before/After**

Route: (TL) ~~NASA~~ Wallops Island, VA **Temperature** *(°F)*: 80 / 80

Observer(s): T Goodwin / C Kraft **Wind speed** *(mph)*: 10 / 10

Instructor **Cloud cover** *(%)*: 0 / 0

Survey replicate # : 3 **Precipitation** *(see below)*: None / None

Total # during survey			
PBGR		VIRA	
LEBI		CLRA	
AMBI		COGA	
BLRA		SORA	
AMCO		CLRA	1

**list all observers in order of their contribution to the data collected*

put an "S" in the appropriate column if the bird was seen, a "1" if the bird was heard, and "1S" if both heard and seen

Station#	Start Time (military)	Background noise	Species	Responded During: Before	Pass 0-1	Pass 1-2	BLRA 2-3	BLRA 3-4	BLRA 4-5	BLRA 5-6	Pass 6-7	VIRA 7-9	Pass 9-10	After	Call Type(s)	Direction	Distance (meters)	Detected at a Previous Point	Comments
1	2125	0	CLRA										1		~~CACK~~ KEK		300		
2	2150	1	—																No birds

Call Types: BLRA: *kicky-doo, grr, churt* RIRA: cltr, kburr, kek, khurrah LEBI: *coo, kak, ert* VIRA: *grunt, ticket, kicker*
SORA: whinny, perweep, keep PBGR: owhoop, hyena COGA: wpt, beep AMCO: burup, honk, hicup AMBI: pump-er-lunk

If the call type is not one of the above listed types, describe the call in the comments column

Precipitation: light rain, rain, heavy rain, light snow, snow, heavy snow, fog, none

Background noise: 0 *no noise* 1 *faint noise* 2 *moderate noise (probably can't hear some birds beyond 100m)*
3 *loud noise (probably can't hear some birds beyond 50m)* 4 *intense noise (probably can't hear some birds beyond 25m)*

Eastern Black Rail (*Laterallus jamaicensis jamaicensis*) Habitat Assessment

Prepared for the

NASA WFF Wallops Island Northern Development Environmental Assessment

Accomack County, Virginia

NASA Wallops Flight Facility
32400 Fulton Street
Wallops Island, VA 23337

Prepared by

AECOM

4840 Cox Road
Glen Allen, VA 23060

December 23, 2020

Table of Contents

APPENDICES

1.0 INTRODUCTION

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) is proposing; developments would constitute a new Intermodal Facility at Wallops Island located in proximity to the existing Mid-Atlantic Regional Spaceport (MARS) Unmanned Aerial Systems (UAS) airstrip (**Appendix A, Figure 1**). Proposed developments could include construction and operation of a Wallops Island Pier Area, a second hangar at the UAS airstrip, potable and wastewater lines to the hangars, airstrip lighting, doubling of the existing access road culvert, a 25-30 vehicle parking lot, and a project support building at the entrance of the access road to the airstrip (Project Area). According to the U.S. Maritime Administration (MARAD), this project has the potential to grow existing site capabilities at Wallops Island; enhance science, technology, engineering, and mathematics (STEM) research opportunities; and spur high-tech/high-paying jobs in a predominately rural area. The Eastern Black Rail (*Laterallus jamaicensis jamaicensis*) was identified as a species with potential to be impacted by Project activities. The Eastern Black Rail was upgraded under the Endangered Species Act (ESA) from proposed to threatened status with 4D rule in the Federal Register (October 8, 2020) effective November 9, 2020 (85 FR 63764). The Virginia Department of Wildlife Resources (VDWR) also lists the species as endangered. To address the Project's potential for impacts to this species, an Eastern Black Rail Habitat Assessment was conducted by AECOM. The results of desktop analysis and field efforts are presented in this document.

2.0 PURPOSE

As part of the National Environmental Policy Act (NEPA) review process Wallops Island Northern Development (WIND) Environmental Assessment (EA), NASA identified the (then candidate species,) the Eastern Black Rail (*Laterallus jamaicensis jamaicensis*) for review. The Eastern Black Rail was documented on WFF Wallops Island in May 2019 (WFF Marsh Fiber Project Draft Environmental Assessment [NASA 2020]). Through subsequent informal conference with U.S. Fish and Wildlife Service (USFWS) during May and July of 2020, a habitat survey was requested by USFWS to identify whether an Eastern Black Rail species survey was needed (USFWS 2020a). The purpose of this document is to satisfy the request of USFWS and document the findings of a habitat assessment to identify whether suitable Eastern Black Rail habitat is present within or near the Project Area. It is anticipated that the habitat assessment results will support the development of further actions addressing the Project's potential for impacts to the Eastern Black Rail including the identification of future survey area and effort, potential impacts associated with design and engineering, and avoidance and minimization measures, as applicable.

3.0 PROJECT AREA

The Project Area is located on Wallops Island in Accomack County, Virginia, east of Atlantic Road (Route 679), north of Causeway Road (Route 803), and south of Chincoteague Island, and can be accessed from North Seawall Road (**Appendix A, Figure 1**). The United States Geological Survey (USGS) Quadrangle map (Quad) for Chincoteague West, VA (USGS 2019) depicts a mix of generally flat non-vegetated land cover and vegetated submerged swamps (including Cow Gut Flat) with Cow Gut bordering the southwest edge of the Project Area. Upland elevations depicted on the Chincoteague Quad range from 5 feet above mean sea level (amsl) to 0 feet amsl. ESRI™ (2019) aerial imagery depicts similar landcover as the USGS Quadrangle (Quad) map, but also shows paved roads, maintained shoulders, and a runway (**Appendix A, Figure 2**). The project figures in **Appendix A** depict the study area, which combines both the potential primary and secondary area of potential effect (APE). The active runway hosts air launches, a variety of personnel, as well as air and vehicular traffic for training events. Resident wildlife would be assumed to have acclimated or moved away from the existing level of noise.

3.1 Primary APE

The proposed project is in the alternative planning stages and final engineering plans or site arrangements were not available at the time of the habitat assessment. Therefore, the anticipated primary APE is based on preliminary site plans or project area with a 50 foot (ft) buffer to account for site-specific adjustments (**Figure 2**).

3.2 Secondary APE

Beyond the 50 ft buffer (or Primary APE), the habitat assessment area was be expanded to include a conservative estimate for a preliminary secondary APE to account for potential effects from light, noise, and hydrology changes from the proposed activities, at the request of the USFWS through the informal conference process. The secondary APE used for the Eastern Black Rail habitat assessment may be further reduced as site-specific construction techniques are coordinated, once a contractor has been selected.

Noise from construction equipment would likely to be intermittent and temporary. Based on the typical equipment roadway construction equipment, attenuation results in a drop-off rate of 7.5 decibel, A-weighted (dBA) per doubling of distance for a point source (**Table 1**). **Table 2** below includes typical construction equipment and their max dBA. The noise emission levels at 50 feet from the point source for pile driving, scraping, paving, and concrete mixing typically range from 80 to 95 dBA. Assuming the maximum noise from construction of 95 dBA, a nuisance level of 73 dBA and above, combined with the estimated the 7.5 dBA attenuation, a conservative potential APE is noted with a 400 ft buffer from the Project Area or noise source (California Department of Transportation 2016).

Noise minimization strategies implemented to the extent practicable during construction may include: temporary noise barriers or sound walls, noise pads or dampers, movable task noise barriers, queuing trucks to distribute idling noise, locating vehicle access points and loading and shipping facilities away from habitat areas, reducing the number of noisy activities that occur simultaneously, relocating stationary equipment away from habitat areas, and use vibration reducing modifications to construction equipment.

Table 1: Anticipated Noise Attenuation based on Federal Highway Administration (FHWA 2006)

Noise level (dBA)	Distance from source ft (m)
95	50 (15)
88	100 (30)
80	200 (61)
73	400 (122)
65	800 (244)

Table 2: Construction Equipment Noise Emission Levels (greatest-to-least)

Equipment	Typical Lmax at 50 feet (15.2 m) from Source (dBA, Slow)
Pile Driver (Impact)	95
Vibratory Pile Driver	95
Rock Drill	85
Paver	85
Scraper	85
Crane	85
Concrete Mixer Truck	85
Dozer	85
Grader	85
Jackhammer	85
Pneumatic Tool	85
Crane	85
Chain w	85
Roller	85
Tractor	84
Concrete Pump Truck	82
Generator	82
Compactor (ground)	80
Compressor (Air)	80
Backhoe	80
Vibratory Concrete Mixer	80
Pumps	77

Lighting for construction is anticipated to be temporary and consistent with best practices which may include: turning off unnecessary lights; facing lights away from the habitat; shielding light sources; and/or using recessed lighting versus exposed light source, directional lighting versus scattered light sources, low-profile low-level lamps on light poles, low pressure sodium vapor lighting, yellow “bug” lights of 25 watts or less versus white incandescent bulbs, and/or motion detector lights with short time settings.

Hydrology impacts are anticipated to be limited to the primary APE depicted in **Figure 2** due to anticipated fill prisms for the proposed grading and structures. Due to the dynamic nature of a tidal-driven saltmarsh, secondary hydrology impacts are not anticipated.

As requested by USFWS, the anticipated, conservative limits of primary and secondary APE were evaluated for noise, light, and hydrology. Of these, it appears that construction noise has the potential to disturb the Eastern Black Rail the furthest distance from the construction activities. Therefore, the potential secondary APE is conservatively defined by a 400 ft buffer (distance to noise attenuation to 73 dBA) from the anticipated sources of construction noise and clipped to certain unsuitable habitat factors such as open water.

4.0 EASTERN BLACK RAIL DESCRIPTION

The Eastern Black Rail is a small, secretive, marsh-dwelling bird that is broadly distributed through portions of the United States, Central America, and South America. The Eastern Black Rail is one of four subspecies of Black Rail and, effective October 9, 2020, is listed as federally threatened by the USFWS under the ESA. The species is additionally protected by VDWR and the Migratory Bird Treaty Act of 1918. Adult Eastern Black Rails vary in size from four to six inches in length, have a wingspan of nine to 11 inches, and weigh less than 0.1 pound. Males and females are similar in size and adults are generally pale to blackish-gray, with a small blackish bill and bright red eyes. Feeding behavior for the Eastern Black Rail is generally unknown but it is believed that they are opportunistic foragers. The shape of their bill suggests adaptations for gleaning or pecking at items. The diet of the Eastern Black Rail consists of small aquatic and terrestrial invertebrates, as well as small seeds (USFWS 2019).

The marsh-dependent species' habitat can be tidally or non-tidally influenced and range in salinity from salt to brackish to fresh. In the northeastern United States, the Eastern Black Rail can typically be found 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 unimpounded salt and brackish marshes (USFWS 2019). The preferred habitat of Eastern Black Rails in Virginia is the salt marsh zone known as high marsh (USFWS 2020a).

There are inherent challenges to studying or surveying for marsh birds. The Standardized North American Marsh Bird Monitoring Protocol (2011) describes marsh birds as “inconspicuous” or “secretive.” Moreover, the Eastern Black Rail has been described as the “most secretive of the secret marsh birds” and lacking basic information on population status and trends in most areas (Watts 2016). It follows that, Eastern Black Rail nesting behavior has not been thoroughly studied but the species is known to tolerate a narrow range of water levels and variation within those water levels (Watts 2016, USFWS 2020b). Nesting sites have been found in the upper reaches of marshes, a few inches above ground or shallow water in clumps of vegetation (Audubon n.d.). Other Black Rail studies specify that nesting habitat requires inundation less than one inch (three cm) in depth (Conway 2011, USFWS 2020b).

The Virginia Institute of Marine Science (VIMS) located in Gloucester, Virginia describes the high marsh habitat zone as only flooded during extreme high tides and storm events. Common vegetation found in Eastern Black Rail habitat includes saltmeadow hay (*Spartina patens)*, chairmaker's bulrush (*Schoenoplectus americanus*), saltgrass (*Distichlis spicata*), and various needlerush (*Juncus*) species (Cornell, 2020). The VIMS salt marsh field guide (VIMS n.d.) distinguishes low marsh that is flooded daily during high tides and exposed during low tides (typified by saltmarsh cordgrass, (*Spartina alterniflora*), black needlerush (*Juncus roemerianus*), and saltmarsh bulrush (*Bolboshoenus robustus*)) from high marsh, which has a higher plant species diversity and includes saltmeadow hay, salt grass, sea lavender (*Limonium carolinanum*), big cordgrass (*Spartina cynosuroides*), marsh elder (*Iva frutescens*), among others. This is consistent with the NatureServe Explorer Floristic Summary for the Atlantic & Gulf Coastal High Salt Marsh which describes vegetation in the upper herbaceous or herb-shrub zones that develops between mean daily high tide and spring tides that still receive tidal influence from spring tides, wind tides, or other events (NatureServe n.d.).

5.0 METHODS

AECOM biologists completed a field reconnaissance following a desktop suitability estimate to determine the extent or presence of suitable high marsh Eastern Black Rail nesting habitat within 400 ft from potential construction noise sources. The desktop suitability estimate was qualitative and designed to guide the field reconnaissance effort which documented vegetation density, composition, and qualitative water level class.

5.1 Desktop Suitability Estimate

AECOM biologists assessed the primary and secondary APE (study area) through analysis of desktop resources prior to field assessment (Figure 3). Historic aerials were also reviewed to estimate where anticipated uplands, high marsh, low marsh, or open water may be located and to guide the planned transect density. Areas anticipated to be open water were noted for spot check during the field survey to determine if a belt transect was required within the 400 ft buffer.

5.2 Field Reconnaissance

Vegetated wetlands and uplands (i.e. not open water) within the study area were evaluated for the presence/absence of suitable Eastern Black Rail high marsh nesting habitat by pedestrian transects spaced approximately 100 ft apart. This spacing was based on the approximate maximum distance that sightlines allowed for visualization of the prior transect line (and not obscured by taller vegetation). During a wetland delineation site visit on July 29, 2020, AECOM biologists noted the extensive monoculture of low marsh west of North Seawall Road. The proposed transect length was reduced and density displayed to 500 ft apart due to the increased sight lines and lack of apparent hummocks or upland islands.

Vegetation zones and transitions among marsh types were located with a hand-held sub-meter accuracy global positioning system (GPS) device to ground truth contour-derived estimates of suitable and unsuitable habitat. Representative photographs of marsh habitat and ecotones were recorded along with semi-quantitative water level class, and vegetation cover type and density. Previously disturbed areas unlikely to encourage bird activities were also recorded with georeferenced photographs.

Alternating colors of photo-degradable flagging tape were used to designate and record the start of each transect lines. Surveyors ran three concurrent transects to use each other as distance cues, ensuring consistent distance to neighboring surveyor. Surveyors used GPS devices to maintain transect lines generally perpendicular to the shoreline and the runway. Uplands and open water areas were spot-checked. In addition to the belt transects, meandering surveys were performed in high marsh habitat with dense stands of reed grass (*Phragmites australis*) due to poor visibility between transects.

Along select points of the transects, representative vegetative cover estimates were recorded for at least three meter-squared quadrats within each upland, high marsh, and low marsh zones within the study area. Vegetation were identified to species where possible according to the *Field Guide to Coastal Wetland Plants of the Southeastern United States* (Tiner, 1987) and cover classes according to Daubenmire (1959, **Table 3**).

Table 3: Vegetation Cover Classes (Daubenmire 1959)

Cover Class	Range of Coverage (%)	Midpoint of Range (%)
1	0-5	2.5
2	5-25	15.0
3	25-50	37.5
4	50-75	62.5
5	75-95	85.0
6	95-100	97.5

Qualitative water level class observations were made along transects to note inundation where:

- 0 = no inundation;
- 1 = surface water at ground level to below the ankle (or top of the toe of a boot);
- 2 = between ankle and knee height;
- 3 = between knee and hip; and
- 4 was deeper than the observer's hip.

As the Eastern Black Rail nesting habitat requires inundation less than one inch (three cm) in depth, water level classes of two or more were considered unsuitable. Desktop delineation of marsh zones were corrected based on georeferenced vegetative field observations. Water depth observations and vegetation density notes were included to remove areas of inundation and unsuitable vegetation composition or density from suitable habitat mapping. Photographs were taken at each vegetation sampling quadrat and along representative vegetation zones and ecotones. It should be noted that the purpose of this habitat survey is not to provide a detailed floral or faunal inventory but to assess the extent and location of suitable high marsh habitat for the Eastern Black Rail and provide a brief characterization of the various salt marsh zonation to provide a thorough review of site conditions in order to verify or adjust the initial desktop findings.

6.0 HABITAT ASSESSMENT RESULTS

The Eastern Black Rail habitat assessment was conducted from August 31 through September 2, 2020 by AECOM biologists. Approximately 40 man-hours were used to survey the approximately 77-acre study area. National Oceanic and Atmospheric Administration (NOAA) tidal water levels during the survey ranged from 0.03 ft to 3.27 ft (**Table 4**). Georeferenced representative photographs taken along transects and spot-checks can be found in **Appendix B.** For general ease of site walking, surveys were completed during lower tides. Therefore, water level classes should be considered conservative with higher inundation levels assumed during higher tides.

A total of 938,590 square feet (22 acres) of high marsh was identified within the study area (**Figure 4**). Most was at or above 2 ft amsl, and typical inundation during the survey ranged between no inundation to inundation up to the observers' knee (i.e., water level class zero to two, **Table 5**). Microtopographic variations in elevation (e.g., hummocks) were not observed. Some upland islands corresponding to higher elevation contours were observed. Vegetative cover and inundation levels were recorded to document areas of high marsh that were unsuitable habitat. High marsh vegetation primarily consisted of saltmeadow hay and reed grass (**Table 6**). Other vegetation species such as sea oxeye (*Borrichia frutescens*), American germander (*Teucrium canadense*), and some scrub-shrub species (wax myrtle [*Myrica cerifera*] and groundsel tree [*Baccharis halimifolia*]) were occasionally found in high marsh. One small area of marginally suitable habitat with black needlerush (*Juncus romarianus*) was mapped on the western portion of the study area (**Photograph 43**). High marsh with inundation category 2 (above the ankle) or more were excluded from suitable habitat (e.g., **Photograph 22**) as were areas of dense reed grass monoculture (e.g., **Photograph 22**). Areas of high marsh are noted as potentially suitable habitat on **Figure 4,** and representative **Photograph 51**.

Only small tracts of maritime forest were observed in the study area—on the western tip and east of the North Seawall Road along the north and south perimeter of the island. Maritime forest habitat was typically located above four feet amsl. Maritime forest canopy coverage greater than 30 percent was considered forested and unsuitable habitat, if not located within 15 feet of high marsh. Woody species observed within maritime forests consist of a high canopy story of loblolly pine (*Pinus taeda*) and a lower understory or scrub-shrub community including black cherry (*Prunus serotine*), red cedar (*Juniperus virginiana*), American holly (*Ilex opaca*), and wax myrtle. The herbaceous vegetation diversity observed within the understory and groundcover was variable. In some areas herbaceous vegetative cover was less than five percent and dominated by greenbrier species (roundleaf greenbrier [*Smilax rotundifoliaa*], saw greenbrier [*S. bona-nox*], cat greenbrier [*S. glauca*]), or poison ivy (*Toxicodendron radicans*), especially along the edge of disturbed plots along the runway and aviation hangar; and along the transition to the high marsh ecotone (**Table 6**). **Photograph 28** depicts typical areas of minimal herbaceous cover under maritime forest. The coverage is sparse and not suitable for black rail habitat. Some areas had greater than 75 percent absolute coverage of greenbrier which does not provide suitable habitat either (**Table 5**).

Uplands were differentiated from maritime forests as areas with historic runway fill that were considerably disturbed or consistently maintained. They were treated similarly to maritime forest where only the upland edge with high marsh was evaluated for potential habitat. Some upland areas meet the high marsh with an ecotonal edge dominated with dense monoculture stands of reed grass, which is categorized as unsuitable habitat (e.g., **Photograph 24**). The uplands located along the southern boundary of the primary APE east of the North Seawall Road transitioned directly into low marsh/salt meadow habitat. The uplands along the airstrip showed evidence of historic alteration, disturbance, and fill. This area was dominated with maintained turfgrass and is included in the unsuitable habitat category on **Figure 4**.

Open water was typically mapped below elevation 1 ft amsl. Areas of open water were still present within the low marsh/salt meadow during the minimum tide interval as encapsulated shallow pools. The ground cover and soils within these pools contained gleyed soils, no vegetation, and had a inundation between the observers' ankle and hip (i.e., water level class between 2 and 3). During the field survey no submerged aquatic vegetation (SAV) was observed. Open water is included in the unsuitable habitat category on **Figure 4** (e.g., **Photograph 3**).

Low marsh was found at elevations between open water and high marsh (generally 1 to 2 ft amsl). Vegetation primarily included smooth cordgrass (*Spartina alterniflora*, **Table 5**). Other species present to a lesser extent, included Carolina sea lavender (*Limonium carolinianum*), glassworts and saltworts (*Salicoria spp.*), salt grass (*Districhlis spicata*), and salt marsh bulrush (*Scripus robustus*) (e.g., **Photograph 42**). Typical inundation during the survey ranged between no inundation and the observers' hip (water level class 0 to 3, **Table 4**). Low marsh was still evaluated in transects to ensure hummocks of high marsh were not overlooked. Low marsh is noted as unsuitable habitat in **Figure 4**. Maritime forest had no inundation (water level class 0) while inundation in the open water habitat was consistently above the observers' ankle (water level class 2 to 4, **Table 5**). High marsh and low marsh inundation varied from no inundation to between the observers' knee and hip (water level class 0 to 3). Potentially suitable habitat was identified along transects CI-003, MB-006, CI-004, MB-008, KN-004, CI-006, CI-007, and MB-001 as well as nearby transects KN-002 and MB-009 (**Table 7**).

Table 4: Tide summary during habitat assessment

Date	Survey start and end time	Min tide[1] during survey (ft)	Max tide[1] during survey (ft)	Min tide[2] level during survey (ft)	Max tide[2] level during survey (ft)	NOAA daily min tide times[2]	NOAA daily max tide time[2]	Tide station mean tidal range[1] (ft)
8/31/2020	1000-1600	-1.72	-0.02	0.03	2.11	0106 1254	06:4 1924	-1.12
9/01/2020	1000-1600	-1.54	0.66	0.03	2.15	0145 1338	0737 2004	-0.80
9/02/2020	0900-1200	0.12	1.59	1.44	3.27	0220 1420	0818 2043	0.98

[1]USGS Water Data for the USA https://nwis.waterdata.usgs.gov/nwis? for Tide Station USGS 01484746 Chincoteague Bay Inlet at Chincoteague, VA.
[2] NOAA iPhone App Tide Alert v2.1 for Wallops Island, VA (NOAA 2019).

Table 5: Qualitative water level class observations according to habitat zone

Date	Survey time start and end	Maritime Forest	High marsh	Low marsh	Open water
8/31/2020	1000-1600	0	0	1	2-4
9/01/2020	1000-1600	0	0-2	0-1	2-4
9/02/2020	0900-1200	0	1	1-3	2-4

Note: [1]0 = no inundation; 1 = surface water at ground level to below the ankle (or top of the toe of a boot);
2 = between ankle and knee height; 3 = between knee and hip; 4 =is deeper than the observer's hip.

Table 6: Vegetative Plot Summary

		High Marsh Plot ID						Low Marsh Plot ID					Maritime Forest Plot ID			
Herbaceous Plot ID		1	2	3	4	5	6	1	2	3	4	5	1	2	3	4
Alternate Plot Name		HM Z01	HM Z-02	MB HM-012	KN-HMW-004	MB-HMW-005	KN-UP2HM-001	LMZ -01	LMZ -02	CJI-LM-veg	KN-LMW-001	KN-LMW-004	KN-UPZ-006	MB UPZ-013	CJI-Veg-001	KN-WA
Water Level Class		0	0		0	1	0	0	0	0	1	1	0	0	0	0
Plant Name (Tiner, 1987)	**Plant Name (BONAP 2018)**															
Spartina patens	*Spartina patens*	5		6	6	6	6									
Scirpus robustus	*Schoenoplectus robustus*					3										
Spartina alterniflora	*Spartina alterniflora*						1	6		5	6	6				
Phragmites australis	*Phragmites australis*	2	6													2
Smilax rotundifolia	*Smilax rotundifolia*	1											1	2	2	5
Distichlis spicata	*Distichlis spicata*							P	6							
Andropogon virginicus	*Andropogon virginicus*													3		
Toxicodendron radicans	*Toxicodendron radicans*													1		
Teucrium canadense	*Teucrium canadense*	2					2									
Limonium carolinianum	*Limonium carolinianum*								2	1						
Pinus taeda	*Pinus taeda*														2	
Myrica cerifera	*Morella cerifera*														2	
Salicornia depressa	*Salicornia depressa*									1						
Iva frutescens	*Iva frutescens*										P					

Daubenmire Cover Class definition: 1 = 0-5%, 2 = 5-25%, 3 = 25-50%, 4 = 50-75%, 5 = 75-95%, 6 = 95-100%; P = presence noted but not quantified; Maritime Forest herbaceous cover does not include saplings and trees. Water level class 0 = no inundation; 1 = surface water at ground level to below the ankle; 2 = between ankle and knee height; 3 = between knee and hip; 4 =is deeper than the observer's hip.

Table 7: Eastern Black Rail Habitat Summary by Transect

Transect ID	Habitat Identified Along Transect	Vegetation Plot ID	Photo ID
MB-003	None		
MB-001	None	High Marsh Plot 1, Low Marsh Plot 1	1, 2, 3
KN-001	None	Low Marsh Plot 4, High Marsh Plot 6	
CI-001	None		
MB-004	None		4, 5
KN-002	Habitat mapped west of transect		6, 7
CI-002	None		
MB-005	None	High Marsh Plot 5	8
CI-003	Habitat mapped along transect	Maritime Forest Plot 3	9, 46
MB-006	Habitat mapped along transect		10, 47
CI-004	Habitat mapped along transect		48
MB-007	None		
KN-003	None		
CI-005	None		11
MB-008	Habitat mapped along transect		12, 49
KN-004	Habitat mapped along transect	Low Marsh Plot 5, High Marsh Plot 3	50
CI-006	Habitat mapped along transect		
MB-009	Habitat mapped near both sides of transect		
CI-007	Habitat mapped along transect		
MB-010	None		13, 14
KN-005	None		15, 16, 17, 18
MB-011	None		19, 20, 21
MB-012	None		22, 23, 24, 25
KN-006	None		28, 29
MB-013	None	Maritime Forest Plot 2	30, 31, 32, 33
MB-014	None		34, 35
CI-010A	None	Low Marsh Plot 3	36
CI-010	None		
MB-015	None		
CI-011	None		
CI-012	None		
KN0007	None		37
CI-013	None		
MB-016	None		38, 39, 40, 41
MB-001	Habitat mapped along transect	Low Marsh Plot 2	42, 43, 44
Unnamed Meander	None	Maritime Forest Plot 4	45
Unnamed Meander	None	High Marsh Plot 2	

7.0 CONCLUSIONS AND RECOMMENDATIONS

According to the USFWS, the Eastern Black Rail requires high marsh habitats with fine-stemmed emergent vegetation with high stem density and dense canopy cover (USFWS 2020c). Ideal vegetation height is generally less than or equal to one meter. Additionally, high marsh habitat with higher shrub density is not considered ideal habitat. They also require, on average, surface water depths less than one inch (three cm) to prevent eggs in the nest from becoming submerged and chicks' down feathers from becoming waterlogged during brood rearing. Based on these habitat requirements, some areas of high marsh habitat in **Figure 4** were not considered potential habitat due to shrub density being too high (e.g.,

Photo 10), vegetation density being too low, vegetation height being too high (e.g., **Photo 14**), or surface water depths greater than one inch (e.g,. **Photo 23**). Areas field identified as potential Eastern Black Rail marsh suitable nesting habitat are anticipated for species survey in Spring of 2021, during the USFWS and VDWR survey window with an approved methodology and using surveyors with *a priori* credential verification.

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Appendix A: Figures

AECOM

National Aeronautic Space Administration Wallops Island Flight Facility 2020

Wallops Pier
Accomack County, VA

Last Date Edited: 9/10/2020
Project Number: 60632314

0 2,500 5,000 Feet

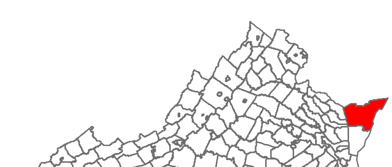
Legend

Study Area

N S E W

Note: This map is for reference only
NAD83 State Plane Virginia North;
Topographic map source: ESRI, 2019

Figure 1
Project Vicinity



Accomack County

AECOM

National Aeronautics and Space Administration Wallops Flight Facility 2020

Wallops Pier
Accomack County, VA

Last Date Edited: 9/10/2020
Project Number: 60632314

0 500 1,000 Feet

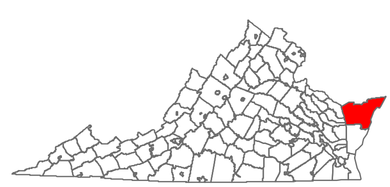
Legend

Study Area

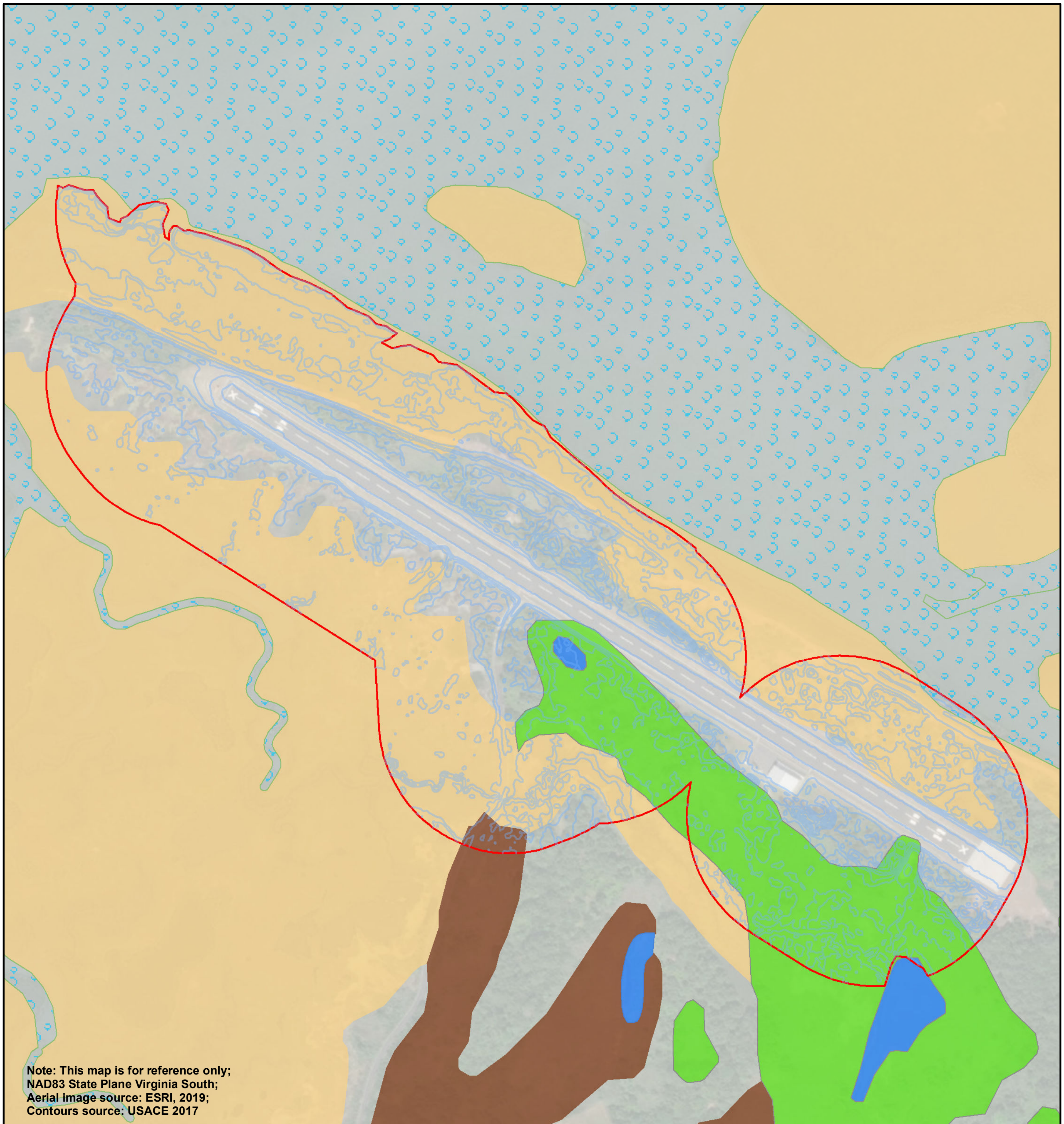
N W E S

Notes: This map is for reference only.
NAD83 State Plane Virginia North; Aerial Image Source: ESRI, 2019

Figure 2
Project Location



Accomack County



AECOM

National Aeronautics and Space Administration Wallops Flight Facility 2020

Wallops Pier
Accomack County, VA

Last Date Edited: 10/19/2020
Project Number: 60617789

Legend

0 250 500 Feet

Study Area

Contours, 1ft. (USACE, 2017)

Waters of the US (NWI, 2020)

Estuarine and Marine Deepwater

Estuarine and Marine Wetland

Freshwater Emergent Wetland

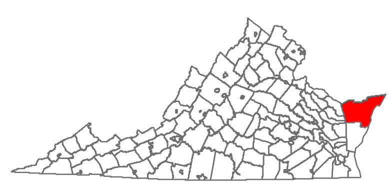
Freshwater Forested/Shrub Wetland

Freshwater Pond

N W E S

Figure 3

Background Resources Map

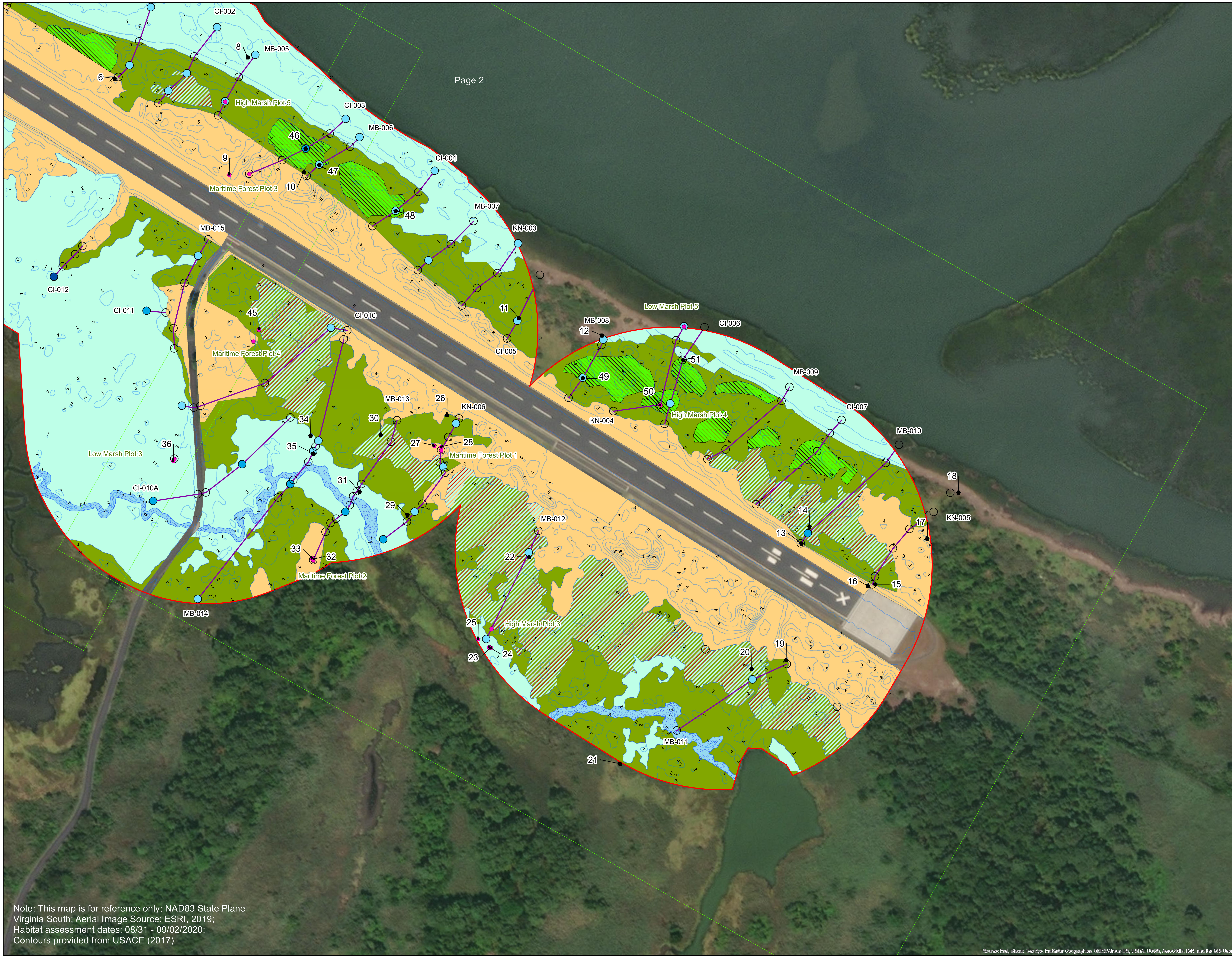


Accomack County


Figure 4
Lateralllus jamaicensis jamaicenses
(Eastern Black Rail)
Habitat Map
Legend
Study Area
Upland and Maritime Forest
High Marsh
Low Marsh
Surface Water
Potential Eastern Black Rail Habitat
Dense Phragmites australis
Transect (MB-001)
Contours, 1ft (USACE, 2017)
Data Points
Photo Location (36)
Vegetation Plot (Low Marsh Plot 1)
Photo Location and Vegetation Plot
Water Level Class
0 (no inundation)
1 (ground level to below ankle)
2 (ankle to knee)
3 (knee to hip)
N
0 200 400
Feet
AECOM
National Aeronautics and
Space Agency
Wallops Flight Facility
Accomack Co., Virginia
Date: 11/12/2020
Note: This map is for reference only; NAD83 State Plane
Virginia South; Aerial Image Source: ESRI, 2019;
Habitat assessment dates: 08/31 - 09/02/2020;
Contours provided from USACE (2017)
Page 1
MB-003
MB-001
KN-001
CI-001
KN-002
CI-002
MB-004
MB-005
CI-003
MB-006
MB-016
CI-013
KN-007
CI-012
MB-015
CI-011
CI-010
CI-010A
MB-013
High Marsh Plot 2
High Marsh Plot 1
High Marsh Plot 6
High Marsh Plot 5
Low Marsh Plot 1
Low Marsh Plot 4
Low Marsh Plot 2
Low Marsh Plot 3
Maritime Forest Plot 3
Maritime Forest Plot 4
Maritime Forest Plot 2

Figure 4

Laterallus jamaicensis jamaicenses (Eastern Black Rail) Habitat Map



Legend

- Study Area
- Upland and Maritime Forest
- High Marsh
- Low Marsh
- Surface Water
- Potential Eastern Black Rail Habitat
- Dense Phragmites australis
- Transect (MB-001)
- Contours, 1ft (USACE, 2017)

Data Points

- Photo Location (36)
- Vegetation Plot (Low Marsh Plot 1)
- Photo Location and Vegetation Plot

Water Level Class

- 0 (no inundation)
- 1 (ground level to below ankle)
- 2 (ankle to knee)
- 3 (knee to hip)

N

0 200 400

Feet

AECOM

National Aeronautics and Space Agency
Wallops Flight Facility
Accomack Co., Virginia

Date: 11/12/2020

Appendix B:
Representative Photographs

Photo Type: Typical Vegetation		
Photo ID: 1	**Photo Date:** 8/31/2020	
Water Level Class: 0	**Transect:** MB-001	
Vegetation Plot: High Marsh Plot 1		
Lat/Long: 37.888191,-75.442321		
Description: Another view of the narrow vegetation coverage with an increase of high scrub (*B. halimifolia, I. frutescens*) densities. The vegetation continues to the western tip of the island and changes to a monoculture of high density Phragmites.		

Photo Type: Typical Vegetation		
Photo ID: 2	**Photo Date:** 8/31/2020	
Water Level Class: 0	**Transect:** MB-001	
Vegetation Plot: High Marsh Plot 1		
Lat/Long: 37.888202,-75.442308		
Description: A narrow strip of high marsh vegetation in transect MB-001 between low marsh and maritime forest or scrub-shrub communities.		

Photo Type: Vegetation Plot		
Photo ID: 3	**Photo Date:** 8/31/2020	
Water Level Class: 0	**Transect:** MB-001	
Vegetation Plot: Low Marsh Plot 1		
Lat/Long: 37.888422,-75.442121		
Description: Monoculture of *Spartina alterniflora* in the low marsh along the northwestern tip of the island. Not suitable habitat due to increase of water levels above 6 cm deep and lack of high stem densities and dense canopy cover.		

Photo Type: Typical Water Level		
Photo ID: 4	**Photo Date:** 9/1/2020	
Water Level Class: 0	**Transect:** MB-004	
Vegetation Plot: N/A		
Lat/Long: 37.887351,-75.439841		
Description: The high tide rack line was prevalent along the southern edge of the island indicating that area experiences large tidal influences.		

Photo Type: Typical Water Level	
Photo ID: 5	**Photo Date:** 9/1/2020
Water Level Class: 1	**Transect:** MB-004
Vegetation Plot: N/A	
Lat/Long: 37.887556,-75.439770	
Description: During low tide the low marsh along the northern shore line had a water level below 3 cm.	

Photo Type: Typical Vegetation	
Photo ID: 6	**Photo Date:** 9/1/2020
Water Level Class: 0	**Transect:** KN-002
Vegetation Plot: N/A	
Lat/Long: 37.886786,-75.439027	
Description: This high marsh habitat in transect KN-002 exhibits dense vegetation with water levels at or above 3 cm during low tide. This would potentially be suitable habitat if water levels were below 3 cm during high tide for successful nesting habitat.	

Photo Type: Ecotone	
Photo ID: 7	**Photo Date:** 9/1/2020
Water Level Class: 0	**Transect:** KN-002
Vegetation Plot: N/A	
Lat/Long: 37.887569,-75.438536	
Description: Open water on the northern boundary of the study area in transect KN-002.	

Photo Type: Typical Vegetation	
Photo ID: 8	**Photo Date:** 9/1/2020
Water Level Class: 1	**Transect:** MB-005
Vegetation Plot: N/A	
Lat/Long: 37.886893,-75.437950	
Description: The low marsh in transect MB-005 was typified with *Spartina alterniflora* at the density shown.	

Photo Type: Typical Vegetation	
Photo ID: 9	**Photo Date:** 9/2/2020
Water Level Class: 0	**Transect:** CI-003
Vegetation Plot: Maritime Forest Plot 3	
Lat/Long: 37.886150,-75.438130	
Description: Upland vegetation in the maritime forest lack groundcover vegetation density. The vegetation coverage does not provide enough protection from predators and provide shelter from the elements.	

Photo Type: Ecotone	
Photo ID: 10	**Photo Date:** 9/1/2020
Water Level Class: 0	**Transect:** MB-006
Vegetation Plot: N/A	
Lat/Long: 37.886150,-75.437529	
Description: This maritime forest to high marsh eco-tone provides unsuitable habitat due to dense woody vine vegetation coverage. This does not provide adequate escape route and mobility from ground dwelling predators.	

Photo Type: Typical Water Level	
Photo ID: 11	**Photo Date:** 9/2/2020
Water Level Class: 0	**Transect:** CI-005
Vegetation Plot: N/A	
Lat/Long: 37.885174,-75.435838	
Description: This unsuitable high marsh habitat displayed water level above 6 cm during low tide. It was surrounded with a dense shrub ecotone to the low marsh.	

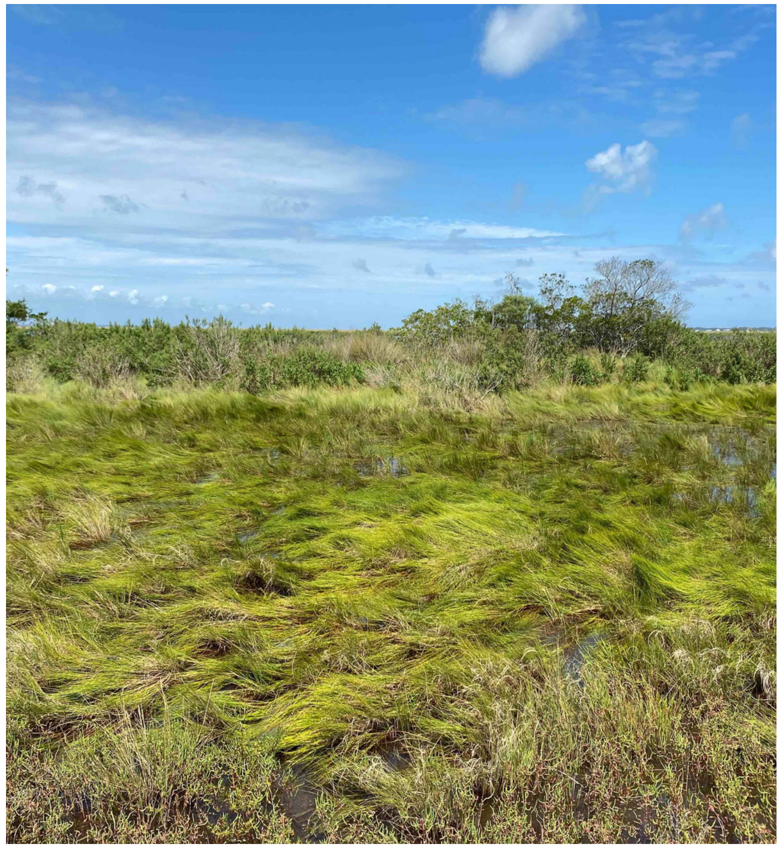


Photo Type: Typical Water Level	
Photo ID: 12	**Photo Date:** 9/1/2020
Water Level Class: 1	**Transect:** MB-008
Vegetation Plot: N/A	
Lat/Long: 37.885046,-75.435175	
Description: This high tide rack line was observed on the northern bank of the island across from the existing hanger. This high tide rack was observed transecting into the high marsh and depositing into pockets in various locations. The topographic change that allows high tidal influences along this portion of the island contributes to the dense phragmites pockets with high water levels. Resulting in poor and unsuitable habitat for nesting. This also indicates that this side of the island experiences high tide surges during storm events.	

Photo Type: Typical Vegetation	
Photo ID: 13	**Photo Date:** 9/1/2020
Water Level Class: 0	**Transect:** MB-010
Vegetation Plot: N/A	
Lat/Long: 37.883676,-75.433623	
Description: This high marsh area displayed unsuitable habitat due to the dense monoculture of *P. australis* with plenty of canopy coverage. In addition, this low-lying pocket had a water level between 10 –38 cm during low tide.	

Photo Type: Typical Water Level	
Photo ID: 14	**Photo Date:** 9/1/2020
Water Level Class: 2	**Transect:** MB-010
Vegetation Plot: N/A	
Lat/Long: 37.883782,-75.433554	
Description: This area of high marsh had unsuitable habitat due to the thick vegetation of *P. australis* and undulated with water levels above 6 cm during low tide. This would not allow adequate mobility and successful nesting conditions.	

Photo Type: Typical Vegetation	
Photo ID: 15	**Photo Date:** 9/1/2020
Water Level Class: 0	**Transect:** KN-005
Vegetation Plot: N/A	
Lat/Long: 37.883402,-75.433041	
Description: This high marsh habitat exhibits dense vegetation with water levels at or above 3 cm during low tide. This would potentially be suitable habitat if water levels were below 3 cm during high tide for successful nesting habitat.	

Photo Type: Dense Phragmites Sites	
Photo ID: 16	**Photo Date:** 9/1/2020
Water Level Class: 0	**Transect:** KN-005
Vegetation Plot: N/A	
Lat/Long: 37.883391,-75.433099	
Description: High density areas of *P. australis* on the edge of the runway in transect KN-005.	

Photo Type: Ecotone		
Photo ID: 17	**Photo Date:** 9/1/2020	
Water Level Class: 0	**Transect:** KN-005	
Vegetation Plot: N/A		
Lat/Long: 37.883683,-75.432611		
Description: This high tide rack line was observed on the northern bank of the island across from the existing hanger. This high tide rack was observed transecting into the high marsh and depositing into pockets in various locations. The topographic change that allows high tidal influences along this portion of the island contributes to the dense phragmites pockets with high water levels. Resulting in poor and unsuitable habitat for nesting. This also indicates that this side of the island experiences high tide surges during storm events.		

Photo Type: Dense Phragmites Site		
Photo ID: 18	**Photo Date:** 9/1/2020	
Water Level Class: 0	**Transect:** KN-005	
Vegetation Plot: N/A		
Lat/Long: 37.883969,-75.432347		
Description: High density area of *P. australis* in transect KN-005. Area not suitable for Eastern Black Rail habitat due to area not being adequate for escape routes from predators.		

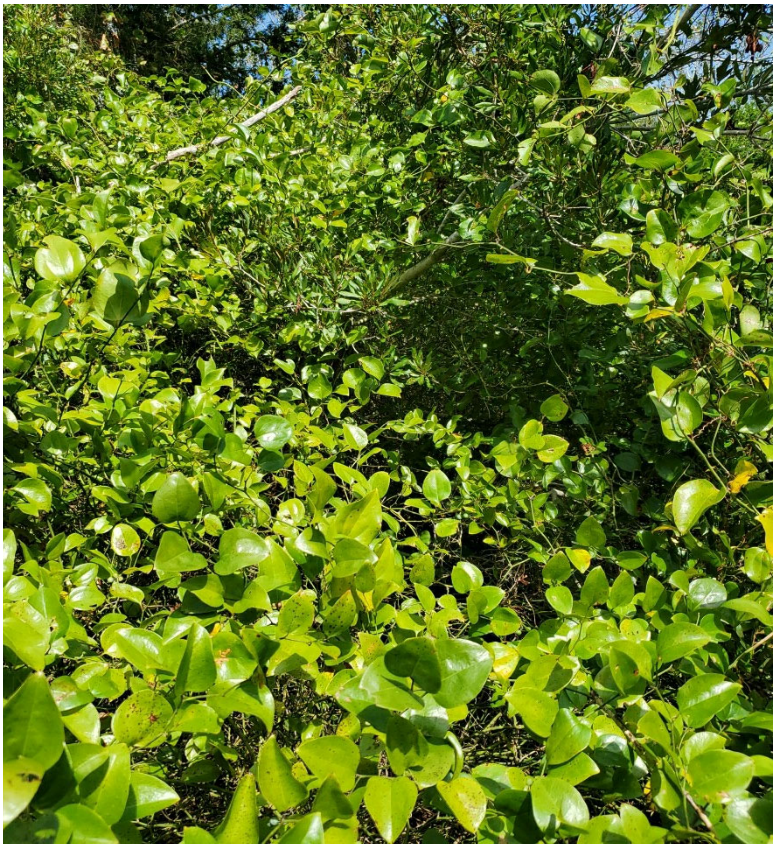
Photo Type: Ecotone		
Photo ID: 19	**Photo Date:** 9/1/2020	
Water Level Class: 0	**Transect:** MB-011	
Vegetation Plot: N/A		
Lat/Long: 37.882935,-75.433777		
Description: This maritime forest to high marsh ecotone provides unsuitable habitat due to dense woody vine vegetation coverage. This does not provide adequate escape route and mobility from ground dwelling predators.		

Photo Type: Typical Water Level		
Photo ID: 20	**Photo Date:** 9/1/2020	
Water Level Class: 1	**Transect:** MB-011	
Vegetation Plot: N/A		
Lat/Long: 37.882888,-75.434057		
Description: Another high marsh area that displayed high water levels above 6 cm during low tide times, which is unsuitable for nesting habitat. This area is located behind the proposed parking area.		

Photo Type: Typical Vegetation		
Photo ID: 21	**Photo Date:** 9/1/2020	
Water Level Class: 1	**Transect:** MB-011	
Vegetation Plot: N/A		
Lat/Long: 37.882309,-75.435140		
Description: High marsh habitat in transect MB-011 that is not Eastern Black Rail habitat due to the vegetation coverage not being fine-stemmed emergent vegetation.		

Photo Type: Typical Water Level		
Photo ID: 22	**Photo Date:** 9/1/2020	
Water Level Class: 1	**Transect:** MB-012	
Vegetation Plot: N/A		
Lat/Long: 37.883647,-75.435818		
Description: High marsh habitat with dense *P. australis* and a surface water level too high for Eastern Black Rail habitat in transect MB-012.		

Photo Type: Vegetation Plot	
Photo ID: 23	**Photo Date:** 9/1/2020
Water Level Class: 1	**Transect:** MB-012
Vegetation Plot: High Marsh Plot 3	
Lat/Long: 37.883078,-75.436150	
Description: This is a view of the southern portion of the study area in High Marsh Plot 3 looking toward North Seawall Road. This area was not suitable habitat due to the high water level greater than 6cm. This photo was taken at low tide where water levels reach above 76 cm.	

Photo Type: Vegetation Plot	
Photo ID: 24	**Photo Date:** 9/1/2020
Water Level Class: 1	**Transect:** MB-012
Vegetation Plot: High Marsh Plot 3	
Lat/Long: 37.883080,-75.436163	
Description: View of High Marsh Plot 3 inundated with open wa-ter and densely vegetated with *P. austra-lis* along the southeastern side of the study area behind the existing hangar.	

Photo Type: Vegetation Plot	
Photo ID: 25	**Photo Date:** 9/1/2020
Water Level Class: 1	**Transect:** MB-012
Vegetation Plot: High Marsh Plot 3	
Lat/Long: 37.883135,-75.436250	
Description: High Marsh Plot 3 was densely covered with salt marsh hay; however, only small sporadic vegetation mounds amongst the open water impoundments were available for nesting. This was unsuitable habitat due to minimum areas of low water levels below 3 cm to allow chicks to forage without becoming waterlogged during swim attempts.	

Photo Type: Typical Vegetation	
Photo ID: 26	**Photo Date:** 9/2/2020
Water Level Class: 0	**Transect:** KN-006
Vegetation Plot: N/A	
Lat/Long: 37.884572,-75.436441	
Description: The transition area from high marsh to low marsh with vegetation density being too high for Eastern Black Rail to maneuver in transect KN-005.	

Photo Type: Vegetation Plot	
Photo ID: 27	**Photo Date:** 9/2/2020
Water Level Class: 0	**Transect:** KN-006
Vegetation Plot: Maritime Forest Plot 1	
Lat/Long: 37.884377,-75.436552	
Description: Upland maritime forested area in Maritime Forest Plot 1 located adjacent to the hanger showing lack of ground level vegetation coverage.	

Photo Type: Vegetation Plot	
Photo ID: 28	**Photo Date:** 9/2/2020
Water Level Class: 0	**Transect:** KN-006
Vegetation Plot: Maritime Forest Plot 1	
Lat/Long: 37.884369,-75.436497	
Description: A photo of the Maritime Forest Plot 1 depicted in Photo 27.	

Photo Type: Typical Vegetation	
Photo ID: 29	**Photo Date:** 9/2/2020
Water Level Class: 0	**Transect:** KN-006
Vegetation Plot: N/A	
Lat/Long: 37.883941,-75.436786	
Description: An upland to high marsh transition in transect KN-006 with a high density of *P. australis* excluding this area as potential habitat for Eastern Black Rail.	

Photo Type: Typical Vegetation	
Photo ID: 30	**Photo Date:** 9/2/2020
Water Level Class: 0	**Transect:** MB-013
Vegetation Plot: N/A	
Lat/Long: 37.884458,-75.436980	
Description: High marsh habitat that consisted of *P. australis* cover too dense for Eastern Black Rail habitat in the south central portion of the study area in transect MB-013.	

Photo Type: Typical Water Level		
Photo ID: 31	**Photo Date:** 9/2/2020	
Water Level Class: 0	**Transect:** MB-013	
Vegetation Plot: N/A		
Lat/Long: 37.884096,-75.437165		
Description: An example of low marsh habitat with water levels too high for Eastern Black Rail habitat in the south central portion of the study area in transect MB-013.		

Photo Type: Vegetation Plots		
Photo ID: 32	**Photo Date:** 9/2/2020	
Water Level Class: 0	**Transect:** MB-013	
Vegetation Plot: Maritime Forest Plot 2		
Lat/Long: 37.883677,-75.437560		
Description: A photo of typical vegetation in Maritime Forest Plot 2.		

Photo Type: Vegetation Plot		
Photo ID: 33	**Photo Date:** 9/2/2020	
Water Level Class: 0	**Transect:** MB-013	
Vegetation Plot: Maritime Forest Plot 2		
Lat/Long: 37.883687,-75.437565		
Description: Upland maritime forest vegetation coverage conditions at Maritime Forest Plot 2.		

Photo Type: Typical Water Level		
Photo ID: 34	**Photo Date:** 9/2/2020	
Water Level Class: 1	**Transect:** MB-014	
Vegetation Plot: N/A		
Lat/Long: 37.884465,-75.437545		
Description: High marsh habitat during low tide in transect MB-014. Water level not ideal for Eastern Black Rail habitat.		

Photo Type: Typical Water Level		
Photo ID: 35	**Photo Date:** 9/2/2020	
Water Level Class: 1	**Transect:** MB-014	
Vegetation Plot: N/A		
Lat/Long: 37.884352,-75.437526		
Description: Low marsh with water levels too high for Eastern Black Rail habitat in the south-west section of the study area in transect MB-014.		

Photo Type: Vegetation Plot		
Photo ID: 36	**Photo Date:** 9/2/2020	
Water Level Class: 0	**Transect:** N/A	
Vegetation Plot: Low Marsh Plot 3		
Lat/Long: 37.884336,-75.438655		
Description: This area at Low Marsh Plot 3 showed areas of impounded water during low tide. In addition, the lack of canopy coverage with little to no high marsh habitat along its border along North Seawall Road.		

Photo Type: Ecotone	
Photo ID: 37	**Photo Date:** 9/2/2020
Water Level Class: 0	**Transect:** KN-007
Vegetation Plot: N/A	
Lat/Long: 37.886772,-75.440436	
Description: Open water within the low marsh of transect KN-007 in the southwestern portion of the study area.	

Photo Type: Typical Vegetation	
Photo ID: 38	**Photo Date:** 9/2/2020
Water Level Class: 0	**Transect:** MB-016
Vegetation Plot: N/A	
Lat/Long: 37.887524,-75.441717	
Description: Maintained uplands on the northwestern edge of the runway at transect MB-013.	

Photo Type: Typical Water Level		
Photo ID: 39	**Photo Date:** 9/2/2020	
Water Level Class: 1	**Transect:** MB-016	
Vegetation Plot: N/A		
Lat/Long: 37.887482,-75.441750		
Description: High marsh habitat in transect MB-016 with stem density too low and water level too high for Eastern Black Rail habitat.		

Photo Type: Ecotone		
Photo ID: 40	**Photo Date:** 9/2/2020	
Water Level Class: 0	**Transect:** MB-016	
Vegetation Plot: N/A		
Lat/Long: 37.887368,-75.441808		
Description: The transition from high marsh to low marsh in transect MB-016 of the south-west portion of the study area.		

Photo Type: Typical Water Level	
Photo ID: 41	**Photo Date:** 9/2/2020
Water Level Class: 1	**Transect:** MB-016
Vegetation Plot: N/A	
Lat/Long: 37.88725,-75.441945	
Description: Low marsh habitat in transect MB-016 with sparse vegetation density and water levels too high for Eastern Black Rail habitat.	

Photo Type: Vegetation Plot	
Photo ID: 42	**Photo Date:** 8/31/2020
Water Level Class: 1	**Transect:** MB-001
Vegetation Plot: Low Marsh Plot 2	
Lat/Long: 37.887813,-75.442925	
Description: The low marsh water level on the southwestern side of the island during low tide was 1 to 7 cm. There were areas of open water that remain impounded at low tide in Low Marsh Plot 2.	

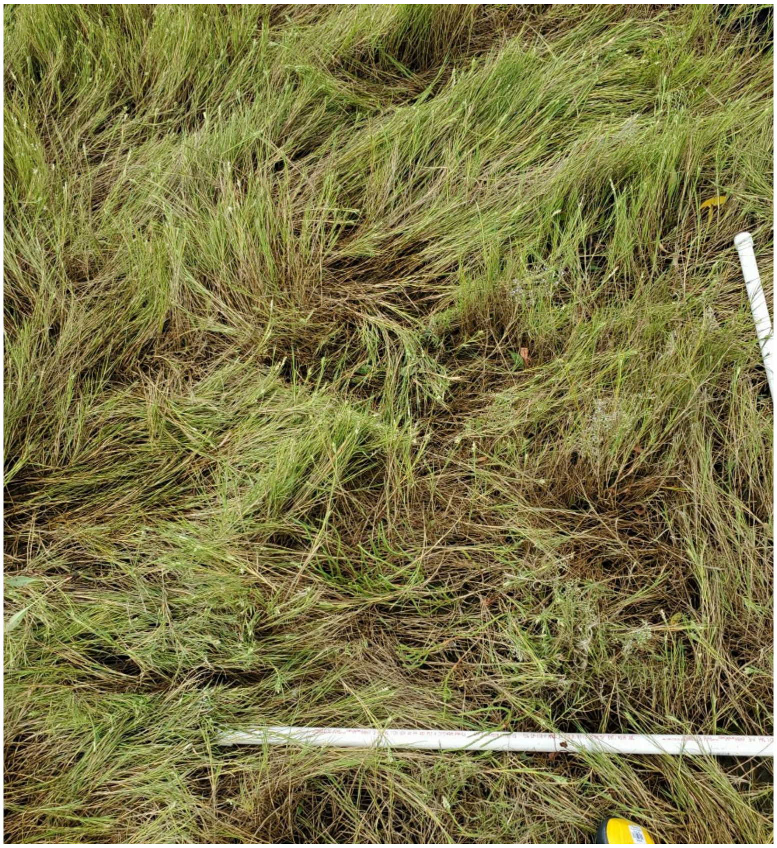


Photo Type: Vegetation Plot		
Photo ID: 43	**Photo Date:** 8/31/2020	
Water Level Class: 1	**Transect:** MB-001	
Vegetation Plot: Low Marsh Plot 2		
Lat/Long: 37.887819,-75.442935		
Description: There was a small area, approximately 0.10 acre, that had a patch of *Juncus roe-merianus* that appeared to be suitable habitat. This was the only location of this species found on the island. Due to the lack in acreage and low canopy coverage, it should be considered only marginal hab-itat.		

Photo Type: Vegetation Plot		
Photo ID: 44	**Photo Date:** 8/31/2020	
Water Level Class: 1	**Transect:** MB-001	
Vegetation Plot: Low Marsh Plot 2		
Lat/Long: 37.887819,-75.442935		
Description: View of the southeastern portion of the *J. roemerianus* vegetation in Low Marsh Plot 2, looking along the southern edge of the runway toward North Seawall Road.		

Photo Type: Vegetation Plot	
Photo ID: 45	**Photo Date:** 8/31/2020
Water Level Class: 0	**Transect:** N/A
Vegetation Plot: High Marsh Plot 2	
Lat/Long: 37.885155,-75.437932	
Description: High density areas of *P. australis* on the edge of the runway in High Marsh Plot 2.	

Photo Type: Typical Vegetation	
Photo ID: 46	**Photo Date:** 9/1/2020
Water Level Class: 2	**Transect:** CI-003
Vegetation Plot: N/A	
Lat/Long: 37.886244,-75.437688	
Description: An example of potential Eastern Black Rail Habitat in transect CI-003 on the northern portion of the study area. Dense fine-stemmed herbaceous vegetation with some canopy coverage is present.	

Photo Type: Typical Vegetation	
Photo ID: 47	**Photo Date:** 9/1/2020
Water Level Class: 1	**Transect:** MB-006
Vegetation Plot: N/A	
Lat/Long: 37.886159,-75.437505	
Description: An example of potential Eastern Black Rail Habitat in transect MB-006 on the northern portion of the study area. Dense fine-stemmed herbaceous vegetation with some canopy coverage is present.	

Photo Type: Typical Vegetation	
Photo ID: 48	**Photo Date:** 9/1/2020
Water Level Class: 1	**Transect:** CI-004
Vegetation Plot: N/A	
Lat/Long: 37.885766,-75.436977	
Description: An example of potential Eastern Black Rail Habitat in transect CI-004 on the northern portion of the study area. Dense fine-stemmed herbaceous vegetation with some canopy coverage is present.	

Photo Type: Typical Vegetation		
Photo ID: 49	**Photo Date:** 9/1/2020	
Water Level Class: 1	**Transect:** MB-008	
Vegetation Plot: N/A		
Lat/Long: 37.884875,-75.435379		
Description: An example of potential Eastern Black Rail Habitat in transect MB-008 on the northern portion of the study area. Dense fine-stemmed herbaceous vegetation with some canopy coverage is present.		

Photo Type: Vegetation Plot		
Photo ID: 50	**Photo Date:** 9/1/2020	
Water Level Class: 0	**Transect:** KN-004	
Vegetation Plot: High Marsh Plot 4		
Lat/Long: 37.884436,-75.434794		
Description: An example of potential Eastern Black Rail Habitat in transect KN-004 on the northern portion of the study area. Dense fine-stemmed herbaceous vegetation with some canopy coverage is present.		

Photo Type: Typical Vegetation	
Photo ID: 51	**Photo Date:** 9/1/2020
Water Level Class: 0	**Transect:** CI-006
Vegetation Plot: N/A	
Lat/Long: 37.884908,-75.434516	
Description: An example of potential Eastern Black Rail Habitat in transect CI-006 on the northern portion of the study area. Dense fine-stemmed herbaceous vegetation with some canopy coverage is present.	

NOAA Fisheries Consultation

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
55 Great Republic Drive
Gloucester, MA 01930

February 28, 2023

Shari A. Miller
NEPA Manager and Environmental Planning Lead
National Aeronautics and Space Administration
Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337-5099

Re: Wallops Island Northern Development, NASA Wallops Flight Facility, Accomack County, Virginia

Dear Ms. Miller:

We have completed our consultation under section 7 of the Endangered Species Act (ESA) in response to your letter dated December 13, 2022, regarding the above-referenced proposed project. We reviewed your consultation request document and related materials. Based on our knowledge, expertise, and your materials, we concur with your conclusion that the proposed action is not likely to adversely affect the NMFS ESA-listed species. Therefore, no further consultation pursuant to section 7 of the ESA is required.

We would like to offer the following information and clarifications to complement your incoming request for consultation. In your description of the proposed action, you state that work on Phase 1 is scheduled to commence in 2022 with completion in 2024. We would like to clarify that, based on the anticipated upper estimate of 24 months to complete Phase 1, construction would occur between 2023 and 2025. For this consultation, we considered a 15-year maintenance dredging cycle. In your description of the action area, you identified "offshore areas potentially affected by pier construction, dredging of channels and turning basins…" We agree that these locations are part of the action area, but would like to clarify that they are part of the action area because they include the maximum extent of the ESA-listed species acoustic behavioral threshold as well as the extent of any turbidity created during in-water construction. In addition, the action area includes all routes traveled by the project vessels, such as from the homeport of the project vessels to the project site, which may be unknown at this time.

In your section identifying ESA-listed species that may occur in the action area, we would like to clarify that ESA-listed large whales (North Atlantic right whales and fin whales) were not considered because of the shallow waters within the action area. We would also like to clarify that, for the same reason, we believe giant manta rays will not occur within the action area.

With respect to the effects of the action, in your analysis of pile driving noise, we would like to clarify that because the noise from pile driving will not exceed the injury or behavioral thresholds for sea turtles, you should conclude that the effects should not be considered further instead of making an insignificant determination. In your analysis of the effects of bottom disturbance during construction, we would like to clarify that because the habitat disturbance would affect a relatively small amount of the available habitat within the action area and because of the temporary nature of the disturbance, the project is expected to result in negligible reductions in benthic shellfish and infaunal organisms that serve as prey for ESA-listed species. Therefore, the effects of habitat modification are too small to be meaningfully measured or detected and are insignificant. We would also like to provide some clarification regarding effects of bottom disturbance during maintenance dredging. Given that there will be only approximately one (1) dredging event approximately every 3-6 years, this will allow benthic habitat to recover enough to provide forage in between dredge events. Additionally, habitat surrounding the action area provides foraging for listed species, and thus individuals are not limited to only opportunistically foraging within the Action Area. As such, aggregate effects of repeated habitat disturbance on listed species will not accumulate over time and effects are expected to be too small to be meaningfully detected and are therefore insignificant. Protection measures and Best Management Practices (BMPs) will also be implemented during maintenance dredging events.

The offshore borrow area and the effects of dredge disposal at the site were previously considered in a Biological Opinion we issued on August 3, 2012 (Biological Opinion on the Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Program (as amended, September 26, 2014)). Because dredge material may be also used for beach renourishment, we would like to provide clarification regarding water quality impacts. Wilber et al. (2006) reported that elevated total suspended sediment (TSS) concentrations associated with an active beach nourishment site were limited to within 1,312 feet (400 meters) of the discharge pipe in the swash zone (defined as the area of the nearshore that is intermittently covered and uncovered by waves). Another study, conducted five years later, found that the turbidity plume and elevated TSS levels were expected to be limited to a narrow area of the swash zone up to 1,640 feet (500 meters) down-current from the discharge pipe (Burlas et al. 2001). Considering beach nourishment materials consist primarily of coarse sands, plumes from the discharge should settle rapidly and not affect large areas. Based on this and the best available information, TSS concentrations created by beach nourishment operations along an open coastline are expected to be between 34.0-64.0 mg/L; limited to an area approximately 1,640 feet (500 meters) down-current from the discharge pipe; and, settle within several hours after discharge cessation. The TSS levels expected for beach nourishment (up to 64.0 mg/L) are below those shown to have adverse effect on fish (typically up to 1,000.0 mg/L; see summary of scientific literature in Burton 1993; Wilber and Clarke 2001) and benthic communities (390.0 mg/L (EPA 1986)). Therefore, the effects of water quality from beach renourishment are too small to be meaningfully measured or detected, and are insignificant.

In the section discussing potential effects associated with construction of the pier, we would like to clarify that the proposed pier will result in the shading of approximately 40,000 square feet of habitat. Benthic habitats can be impacted indirectly by shading by overwater structures. Shading has been found to adversely affect tidal marshes, submerged aquatic vegetation, and benthic invertebrate communities (Struck et al. 2004). Since no shellfish beds or submerged aquatic vegetation occur in this area, impacts to habitat from shading are expected to be insignificant.

In your discussion of impacts from vessel interactions, we would like to clarify that adding vessels to the existing baseline will not increase the risk that any vessel in the area will strike an individual or will increase it to such a small extent that the effect of the action (i.e., any increase in risk of a strike caused by the project) cannot be meaningfully measured or detected. Therefore, because any increase in risk of a vessel interaction with listed species is too small to be meaningfully measured or detected, the analysis supports a determination that effects are insignificant. These clarifications do not alter your analysis or conclusion and thus no further consultation pursuant to section 7 of the ESA is required.

On July 5, 2022, the U.S. District Court for the Northern District of California issued an order vacating the 2019 regulations that were revised or added to 50 CFR part 402 in 2019 ("2019 Regulations," see 84 FR 44976, August 27, 2019) without making a finding on the merits. On September 21, 2022, the U.S. Court of Appeals for the Ninth Circuit granted a temporary stay of the district court's July 5 order. On November 14, 2022, the Northern District of California issued an order granting the government's request for voluntary remand without vacating the 2019 regulations. The District Court issued a slightly amended order two days later on November 16, 2022. As a result, the 2019 regulations remain in effect, and we are applying the 2019 regulations here. For purposes of this consultation and in an abundance of caution, we considered whether the substantive analysis and conclusions articulated in the letter of concurrence would be any different under the pre-2019 regulations. We have determined that our analysis and conclusions would not be any different.

Reinitiation of consultation is required and shall be requested by the Federal agency or by the Service, where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (a) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in the consultation; (b) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this consultation; or (c) If a new species is listed or critical habitat designated that may be affected by the identified action. No take is anticipated or exempted. If there is any incidental take of a listed species, reinitiation would be required.

Should you have any questions about this correspondence please contact Brian Hopper at 240-628-5420 or by email (brian.d.hopper@noaa.gov). For questions related to Essential Fish Habitat please contact Mr. David O'Brien, with our Habitat and Ecosystem Services Division at 804-684-7828 or david.l.obrien@noaa.gov.

Sincerely,

Mark Murray-Brown

for Jennifer Anderson
Assistant Regional Administrator
for Protected Resources

ECC: O'Brien, NMFS HESD
ECO: GARFO-2022-03514
File Code: H:\Section 7 Team\Section 7\Non-Fisheries\NASA\2023\Wallops Island Northern Development

Kisak, Natalie

From: Miller, Shari (WFF-2500) <shari.a.miller@nasa.gov>
Sent: Tuesday, December 13, 2022 4:28 PM
To: jennifer.anderson@noaa.gov
Cc: David O'Brien (david.l.obrien@noaa.gov); Brian Hopper (Brian.D.Hopper@noaa.gov); Bahnson, Sara E CIV USARMY CENAO (USA); Finio, Alan (MARAD); Meyer, T J (WFF-2500); Finch, Kimberly (GSFC-2500); Levine, Lori (GSFC-2500); Brittingham, Alan L. (WFF-013.0)[Virginia Commercial Space Flight Authority]
Subject: RE: Project Review Request, Wallops Island Northern Development, NASA WFF
Attachments: NASA WFF WIND - NOAA_TE Consult Ltr_121322.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Ms. Anderson:

Based upon public comments received on the draft Wallops Island Northern Development Environmental Assessment (WIND EA) and your agency's comments on the Section 7 consultation letter, NASA Wallops Flight Facility and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) are resubmitting the attached consultation. NASA and VA Space propose to construct of a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel. NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Endangered Species Act (ESA) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfil their requirements.

Based on the analysis in the attached assessment, all effects of the Proposed Action would be insignificant and/or discountable, we have determined that the Wallops Island Northern Development Project may affect but is not likely to adversely affect any listed species or critical habitat under NOAA Fisheries' jurisdiction. We certify that we have used the best scientific and commercial data available to complete this analysis. We request your concurrence with this determination.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Thank you.

Shari A. Miller

Center NEPA Manager and
Natural Resources Lead
NASA GSFC Wallops Flight Facility
Wallops Island, VA 23337
(757) 824-2327
Shari.A.Miller@nasa.gov

https://code200-external.gsfc.nasa.gov/250-wff/

"The smallest act of kindness is worth more than the grandest intention." – Oscar Wilde

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From: Miller, Shari A. (WFF-2500)
Sent: Wednesday, November 10, 2021 12:11 PM
To: jennifer.anderson@noaa.gov
Cc: Nate Overby <nathan.overby@vaspace.org>; David O'Brien (david.l.obrien@noaa.gov) <david.l.obrien@noaa.gov>; Brian Hopper (Brian.D.Hopper@noaa.gov) <Brian.D.Hopper@noaa.gov>; brian.c.denson@usace.army.mil; Finio, Alan (MARAD) <alan.finio@dot.gov>; TJ Meyer <theodore.j.meyer@nasa.gov>; Kimberly Finch (GSFC-2500) (kimberly.s.finch@nasa.gov) <kimberly.s.finch@nasa.gov>; Levine, Lori M. (GSFC-2500) <lori.m.levine@nasa.gov>
Subject: Project Review Request, Wallops Island Northern Development, NASA WFF

Dear Ms. Anderson:

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) proposes to construct a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel. NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Endangered Species Act (ESA) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfil their requirements.

Based on the analysis in the attached assessment, all effects of the Proposed Action would be insignificant and/or discountable, we have determined that the Wallops Island Northern Development Project may affect but is not likely to adversely affect any listed species or critical habitat under NOAA Fisheries' jurisdiction. We certify that we have used the best scientific and commercial data available to complete this analysis. We request your concurrence with this determination.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Thank you.

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"Remember there's no such thing as a small act of kindness. Every act creates a ripple with no logical end." —Scott Adams

National Aeronautics and Space Administration

Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337

Reply to Attn of: 250.W December 13, 2022

Ms. Jennifer Anderson
Protected Resources Division
Greater Atlantic Regional Fisheries Office
NOAA Fisheries Service
55 Great Republic Drive
Gloucester, Massachusetts 01930

Re: Project Review Request, Wallops Island Northern Development, NASA Wallops Flight Facility, Accomack County, Virginia

Dear Ms. Anderson:

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) proposes to construct a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel (**Figures 1 and 2**). NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Endangered Species Act (ESA) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfill their requirements.

NASA is preparing an Environmental Assessment (EA) in compliance with NEPA to analyze the potential effects of the proposed action on the environment. The EA will be tiered from the May 2019 *NASA WFF Site-Wide Programmatic Environmental Impact Statement* (PEIS), in which NASA evaluated the environmental consequences of constructing and operating new facilities and infrastructure at WFF.

The purpose of this letter is to provide information about the proposed project and to request your concurrence with our determinations regarding potential effects on federally listed threatened and endangered species under National Oceanic and Atmospheric Administration (NOAA) Fisheries jurisdiction in the action area. Additionally, NASA and VCSFA, along with MARAD and USACE, are concurrently consulting with the U.S. Fish and Wildlife Service (USFWS) on terrestrial species under their jurisdiction in the action area.

Background

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 2019a). The M-95

Marine Highway Corridor 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 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 2019b).

VCSFA 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 STEM 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 launches to orbital trajectories. This led to the establishment of the Mid-Atlantic Regional Spaceport (MARS) which is owned and operated by VCSFA.

Development of a port and operations area to support the activities of NASA, WFF tenants, and MARS at the north end of Wallops Island was evaluated at a programmatic level of detail in the 2019 *Final Site-wide PEIS* (NASA 2019). NASA has several long-term tenants and customers that use the WFF research airport and Wallops Island launch range, its facilities, and airspace.

<u>Description of the Proposed Action</u>

Under the Proposed Action, the MARS Port, including a 398-meters (m) (1,305-feet [ft]) fixed pier and turning basin, would be constructed adjacent to the unmanned aerial system (UAS) airstrip located at the north end of Wallops Island (**Figures 1 and 2**). 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 intermodal facility as part of the MARAD M-95 Marine Highway Corridor. Upland infrastructure (new facilities and improvements to the existing access road, airstrip, and utilities) would likewise be constructed/installed as part of the Proposed Action. Access road improvements would include widening of an existing culvert. Although shown for completeness in **Figure 2**, upland activities that would not affect species under NOAA Fisheries jurisdiction are not discussed further.

The Proposed Action would also include the dredging of a new and existing channel to enhance the vessel approach to the pier (**Figure 3**). Mechanical dredging (i.e., clamshell bucket dredge) would be utilized for all dredging activities associated with the Proposed Action. 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 vessel approach channel, which interfaces with two Federal waterways, the Chincoteague Inlet Channel and the Chincoteague Inlet to Bogues Bay connecting waters, would initially be used by a variety of shallow-draft, manned and unmanned vessels. Ultimately, the proposed channel would have a length of approximately 3,900 m (12,800 ft), a width of 30 m (100 ft), and a final depth of 3.7 m (12 ft) below mean lower low water (MLLW). Components of the Proposed Action are further described below.

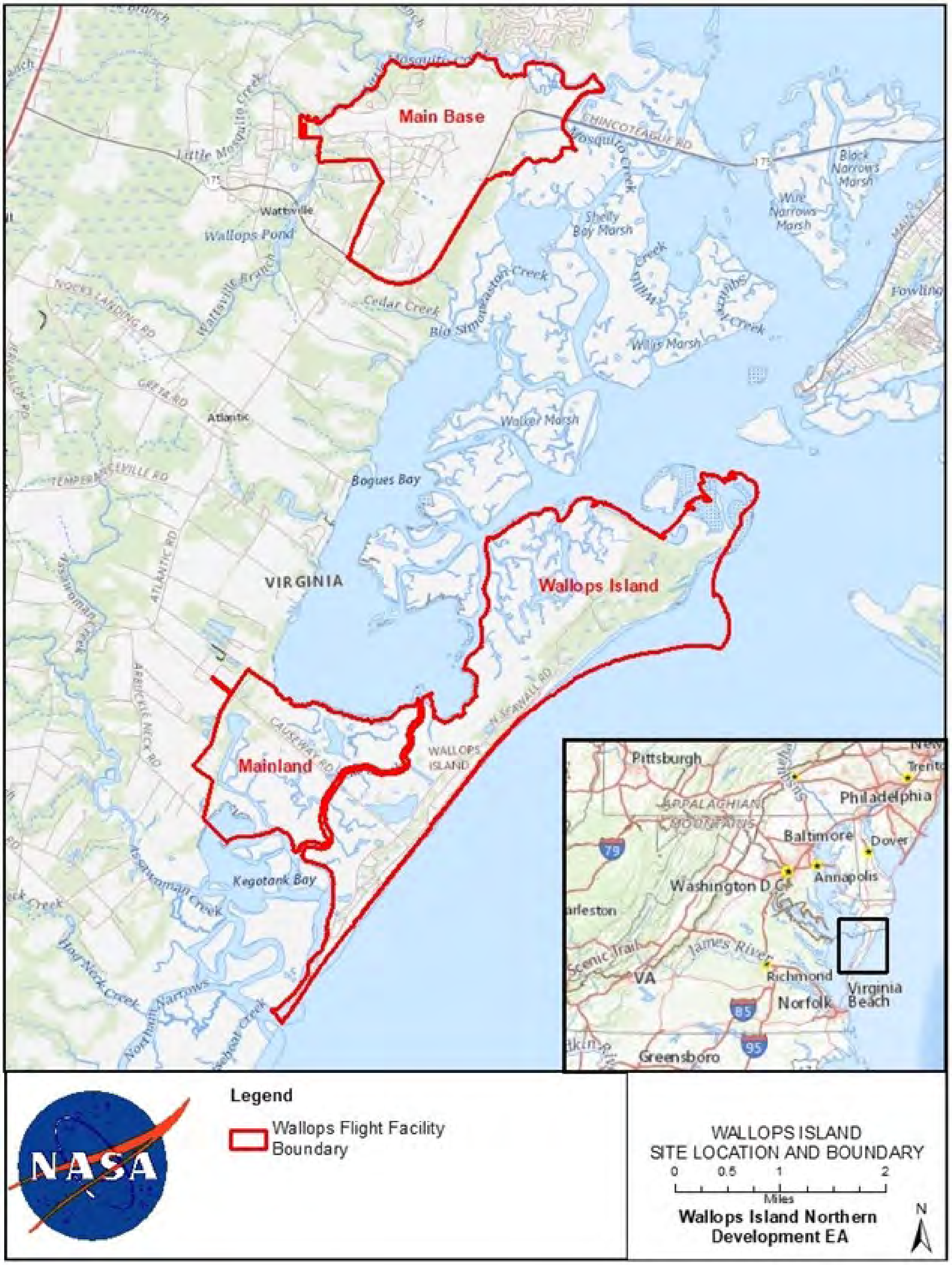


Figure 1. NASA WFF Location

Figure 2. Proposed MARS Port and Infrastructure Components

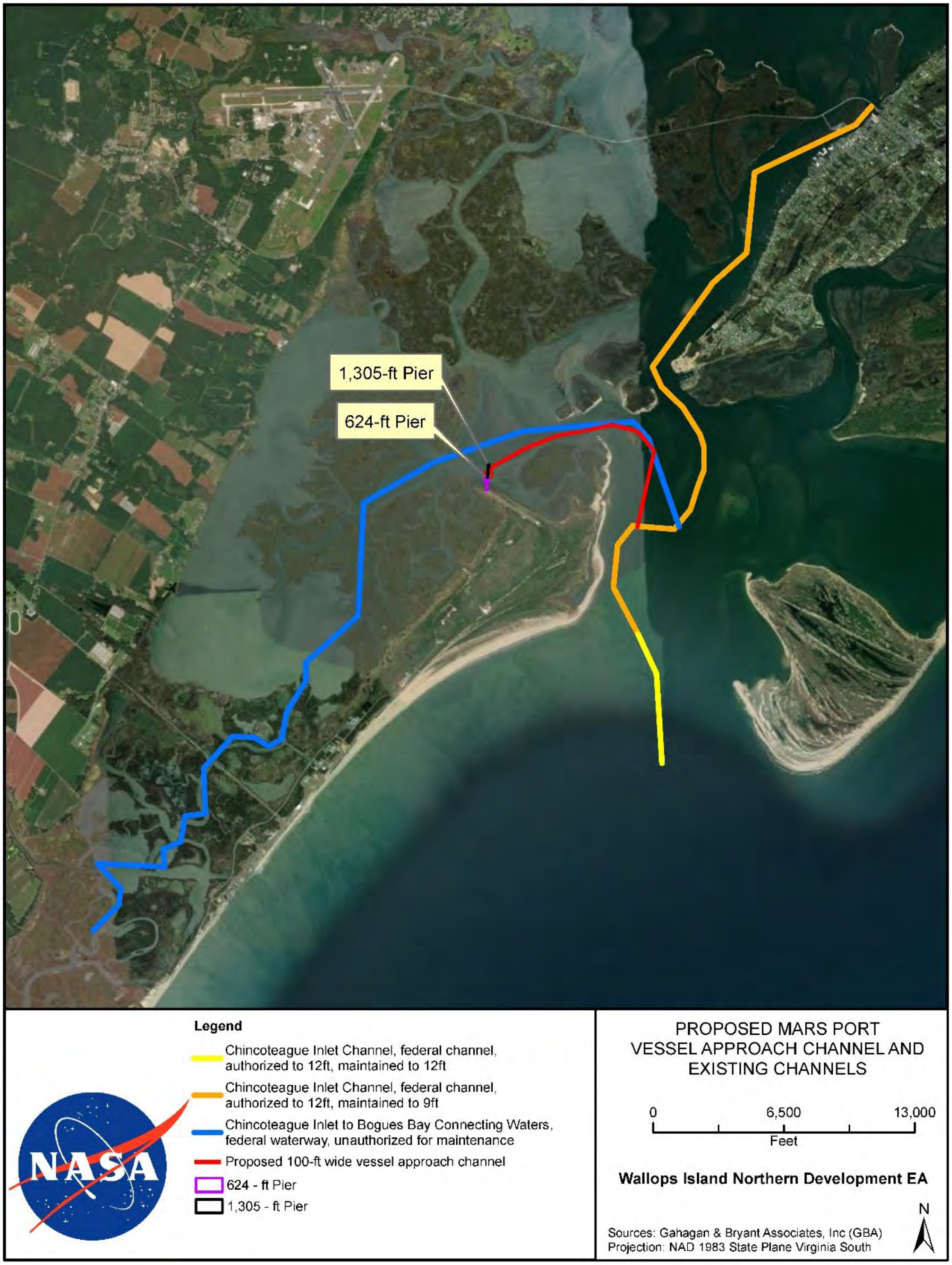


Figure 3. Proposed MARS Port Vessel Approach Channel and Existing Channels

Proposed Action In-Water Components

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. The MARS Port would provide a port and operations area along with associated capabilities for MARS, NASA WFF, and other customers. The MARS Port would also serve as a new part of the MARAD M-95 Marine Highway Corridor.

The Proposed Action would also include the dredging of an existing channel for enhanced vessel approach purposes. The vessel approach channel, which would interface with both the Chincoteague Inlet Federal Channel and the Bogues Bay connecting waterways, would be used by a variety of manned and unmanned vessels. It 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.

Construction of the Proposed Action would be carried out in three phases:

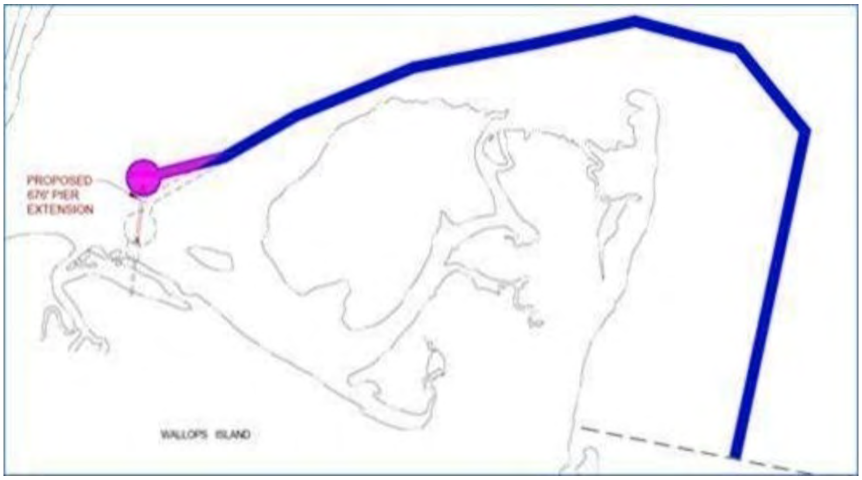
- **Phase 1** would be construction of a 190-m (624-ft) fixed pier, a 61-m (200-ft) radius turning basin 2.7 m (9 ft) deep below MLLW and dredging of the vessel approach channel to a final depth of 1.5 m to 2.7 m (5 ft to 9 ft) below MLLW (red outline in **Figure 4**). Additionally, improvements would 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. A 40-m (130-ft) long segment of the access road would be widened from 4.5 m to 9 m (15 ft to 30 ft) in conjunction with the widening of the culvert over which the road crosses a headwater drainage channel to Cow Gut.
- **Phase 2** would be construction of a 206-m (676-ft) 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 4**) to a final depth of 2.7 m (9 ft) below MLLW. Phase 2 would begin approximately 1 to 2 years after Phase 1 is complete.
- **Phase 3** of construction would be additional dredging of the turning basin and vessel approach channel to a final depth of 3.7 m (12 ft) below MLLW, specifically the portion of the channel from the Phase 2 turning basin to where it meets the Chincoteague Inlet Federal Channel (shaded blue on **Figure 4**). The previously dredged area that would be dredged again to increase its depth would total approximately 13.4 hectare (ha) (33 acre [ac]). Phase 3 would begin approximately 1 to 2 years after Phase 2 is complete.

Phases for the Proposed Action would be driven by customer need, which would increase operational tempo, and ultimately be tied to available 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 portion of the channel shown in pink on **Figure 4**, 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 2022 and being completed by 2024, 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 Additional information about the proposed piers and other port components is provided in Chapter 2 of the Draft EA.

Typical equipment used during pier 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. Concrete pilings would be installed using a soft-start procedure. The soft-start method involves initially driving the pile with a low hammer energy that is gradually increased to allow marine mammals that may be in the action area to detect the presence of noise-producing activities and to depart the area before full-power pile-driving begins. The soft-start procedure would not begin until the exclusion zone surrounding the project location is monitored/cleared for the presence of marine mammals and sea turtles.

A variety of shallow-draft (0.6- to 1.2-m [2- to 4-ft]), manned and unmanned vessels would be serviced by the 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 requiring approximately 2.4 m (8 ft) of draft. Vessels originating from overseas or from the Ports of New York/New Jersey, Norfolk (Virginia), Baltimore (Maryland), Philadelphia (Pennsylvania), or Wilmington (Delaware) would enter the Chincoteague Inlet Federal Channel and the Bogues Bay connecting waterways to the proposed approach channel and turning basin for the pier (**Figure 3**). The proposed width of the approach channel, approximately 30 m (100 ft), is consistent with the dimensions of the Federal Channel. Estimated dredging volumes for the vessel approach channel and turning basin are provided in **Table 1**.



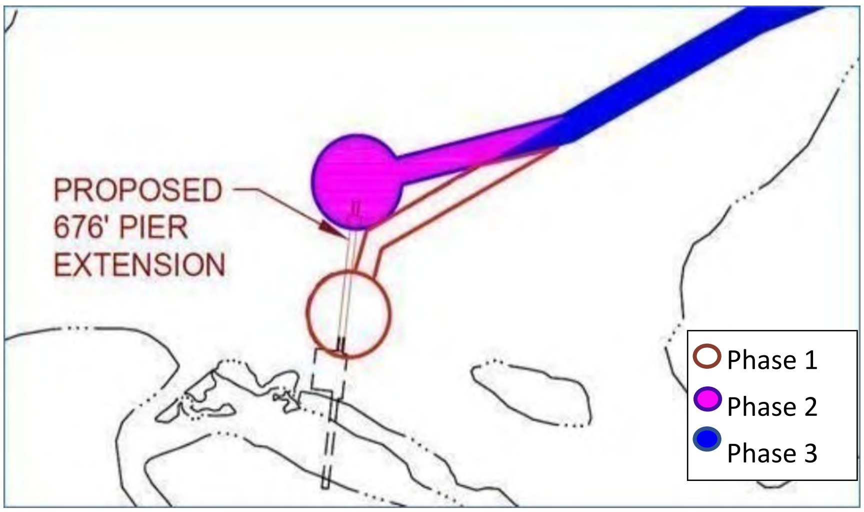


Figure 4. Diagram of Proposed Phased Construction

Table 1. Channel Dimensions and Estimated Dredging Volumes			
	Phase 1	**Phase 2**	**Phase 3**
Channel depth (depth below MLLW)	2.7 m (9 ft)	2.7 m (9 ft)	3.7 m (12 ft)
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)**

m^3 = cubic meters, yd^3 = cubic yards

Dredged Material Placement Decision

The five potential sites considered for the placement of dredged material are summarized in **Table 2** and shown on **Figure 5**. The Proposed Action (Phases 1, 2, and 3) would result in a total volume of 72,100 m^3 (94,200 yd^3) of dredged material requiring placement. VCSFA intends to utilize Option 4, the Wallops Island Shoreline Protection Placement, as the preferred dredged material placement option. 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 (90%+ 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 composed of approximately 95% sand and, therefore, would be suitable for shoreline renourishment. The geotechnical report for the MARS Port is provided as Attachment 1.

The material dredged during Phase 1 (between 42,000 m^3 and 43,000 m^3 [56,000 y^3 and 57,000 y^3]) 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). 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.

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 made using historic dredge records made available by the Norfolk District of the USACE. It was assumed that the proposed channel could be maintained at a navigable depth of 2.7 m (9 ft) or 3.6 m (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 cubic meters per year (m^3/yr) (1,400 to 12,000 cubic yards per year [yd^3/yr]), depending on the depth and location(s) that need to be dredged.

Table 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	Description
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)	--	This area is located just offshore of Wallops Island with a transportation distance of the dredged material of approximately 7.4 km (4 nautical mi). Open water placement options typically present the lowest cost dredging option and allows 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
2	Wallops Island Flood Protection/ Upland Placement	Reuse of material for flood mitigation through upland placement at site identified by NASA	--	850 m (2,800 ft)	--	3,700 m (12,040 ft)	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 crossing 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.

Table 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	Description
3	Greenbackville, VA, 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)	200 m (650 ft)	The third dredged material placement option identified is the use of the upland Dredged Material Containment Facility (DMCF) owned and managed by the USACE. The 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 18.5 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.

Table 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**	**Description**
4	Wallops Island Shoreline Protection Placement	Reuse of material for shoreline protection and beach repair	12.1 km (7.5 mi)	--	9.7 km (6 mi)	--	This option would involve the beneficial reuse of clean, compatible sand from the dredged material to repair and protect areas of the shoreline on Wallops Island. Based on the March 2021 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. 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 5). 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.

Table 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	Description
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)	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 with the Swan Cove Pool Restoration Project design criteria, it would be used by 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 under sized culvert restricting sediment deposition and tidal flow. Although USFWS would prefer material with a high proportion of sand, they would 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. Once pumped, USFWS would assume responsibility for sediment placement and securing appropriate permits.

[1] Sail distance = 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 (statute miles)
[2] Pipe distance = the length of pipe required to reach the placement site from the centroid of dredging or from the anchorage for a vessel loaded with dredged material

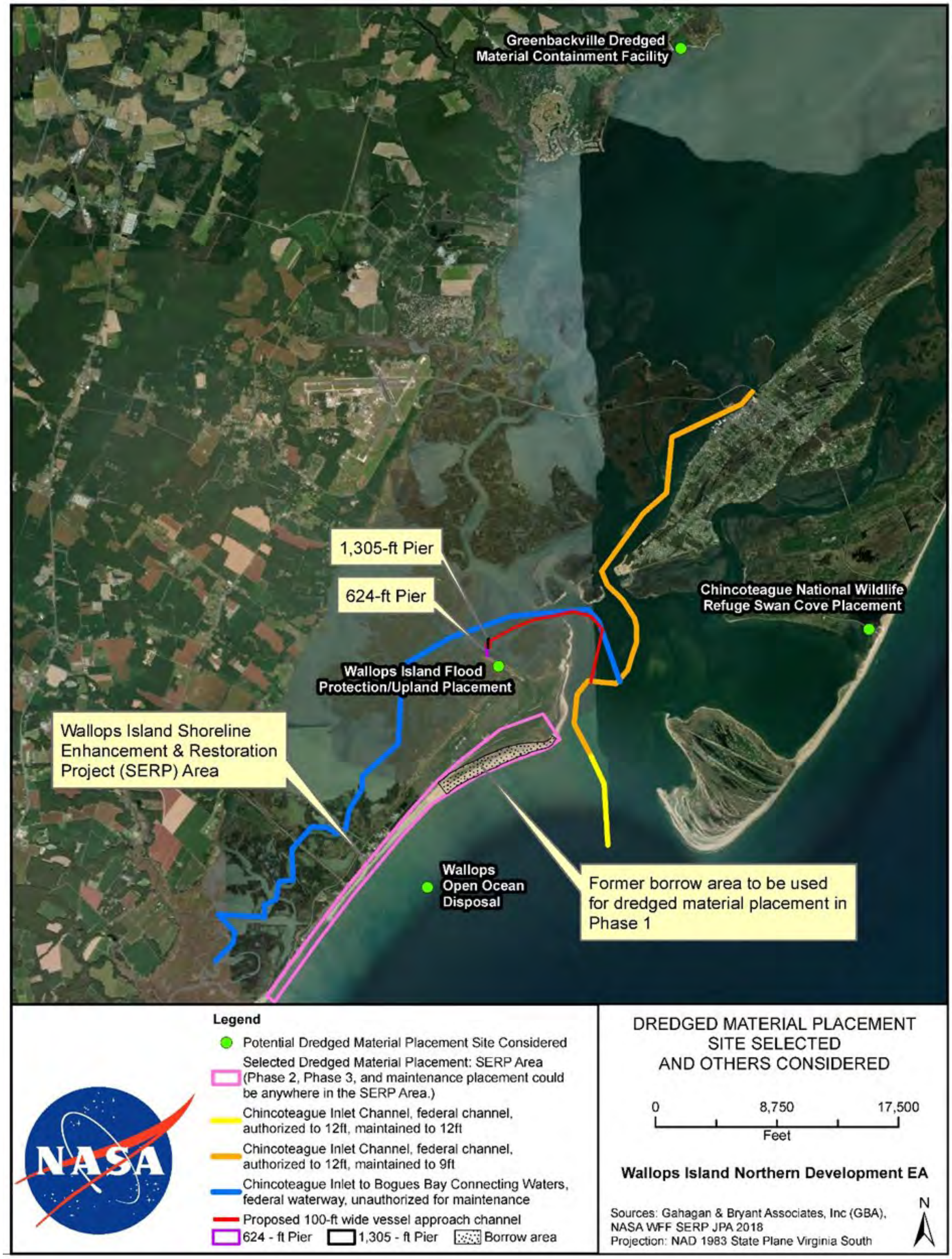


Figure 5. Dredged Material Placement Site Selected and Others Considered

Summary of Proposed Action Construction Activities

Construction of the Proposed Action would involve: (1) construction of onshore and pier components that would make up the MARS Port, (2) mechanical dredging of the vessel approach channel and turning basin, (3) placement of dredged material, and (4) construction or improvement of the proposed onshore facilities and infrastructure.

The estimated timeframe for construction of the Proposed Action would have Phase 1 beginning in 2022 and being completed by 2024, with subsequent phases occurring approximately 1 to 2 years after completion of the prior phase. 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 398 m [1,305 ft]) would take approximately 9.5 months to complete.

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/day, 7 days a week, with two crews each working 12-hour shifts.

In addition to in-water components of the Proposed Action, onshore facilities and infrastructure would be constructed or upgraded, including installation of a temporary wastewater holding tank from which wastewater would be periodically collected and pumped into the NASA wastewater system for treatment. In accordance with the WFF Integrated Contingency Plan, precautions would be taken prior to and during collection from the temporary tank and while pumping into the wastewater collection system. It is assumed that construction of all proposed onshore project components and infrastructure would be completed during Phase 1.

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.

Summary of Proposed Action Operational Activities

VCFSA/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 fencing. During summer months, a mosquito fogging service truck sprays the airfield once every two weeks. Additionally, the pier structure would require quarterly structural inspections.

Potential usage of the MARS Port facility during its operation is provided in **Table 3**.

Table 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 push boat	1 per 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

Table 3. Potential MARS Port Operations/Facility Usage				
Potential Facility Usage	**Vessel Type**	**Quantity Assumptions**	**Total Barge / Vessel Trips**	**Phase Associated with Usage**
Commodity delivery	Deck barge & ocean tug	16 total barges	16	3
Total Barge / Vessel Trips			**99**	

Description of the Action Area

The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR 402.02). For this project, the action area includes the north end of Wallops Island surrounding the UAS Airstrip including the surrounding waters from Chincoteague Inlet to the east and north and to Bogues Bay to the west, i.e., the offshore areas potentially affected by pier construction, dredging of channels and turning basins, and vessels transiting between the proposed pier and the existing Chincoteague Inlet Federal Channel. As described above, 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 Wallops Island beach in the SERP area (**Figure 5**). The elements of the ongoing SERP activities to protect Wallops Island shoreline infrastructure through beach renourishment are described in detail in the *2019 SERP EA* (NASA 2019c).

The offshore habitats within the action area include tidal marsh communities and the estuarine surface waters of Chincoteague Inlet, Bogues Bay, Ballast Narrows, and other waterways. The nearest beds of submerged aquatic vegetation are approximately 4.8 km (3 miles) north of the action area. Waters in the action area contain public and private harvesting areas for shellfish (oysters and clams).

These areas are expected to encompass all of the effects of the proposed project. NASA is concurrently consulting with USFWS under Section 7 of the ESA and any upland or out-of-water work will not be considered further in this consultation.

NMFS Listed Species (and Critical Habitat) in the Action Area

The federally listed species and life stages with the potential to occur in the action area were identified through a query of the NOAA Fisheries Section 7 online mapping application (the ESA Section 7 Mapper) as having the potential to occur in the action area. The information from the ESA Section 7 Mapper is included in Attachment 2. **Table 4** summarizes the information for each species regarding the life stages that could be present, the time of year when they may be present, and the types of behaviors they are expected to be engaged in when present in the waters of the action area.

Table 4. Federally Listed Species Under NOAA Fisheries Jurisdiction Potentially Occurring in the Action Area

Common Name	Scientific Name	Listing Status	DPS	Life Stage	Behavior	Time of Year	Recovery Plan
Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*	Threatened/ Endangered	All	Adult and subadult	Migrating and foraging	1 Jan – 31 Dec	N/A
Giant manta ray	*Manta birostris*	Threatened	N/A	Adult	Migrating and foraging	1 Jan – 31 Dec	N/A
Leatherback sea turtle	*Dermochelys coriacea*	Endangered	N/A	Adult and juveniles	Migrating and foraging	1 May – 30 Nov	NMFS & USFWS 1992
Loggerhead sea turtle	*Caretta caretta*	Threatened	Northwest Atlantic	Adult and juveniles	Migrating and foraging	1 May – 30 Nov	NMFS & USFWS 2008
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered	N/A	Adult and juveniles	Migrating and foraging	1 May – 30 Nov	NMFS et al. 2011
Green sea turtle	*Chelonia mydas*	Threatened	North Atlantic	Adult and juveniles	Migrating and foraging	1 May – 30 Nov	NMFS & USFWS 1991

Notes:
DPS = Distinct population segment
N/A = Not applicable
Source: NOAA Fisheries (2020)

One listed fish species (Atlantic sturgeon) and four listed sea turtle species (leatherback, loggerhead, Kemp's ridley, and green) were identified by the ESA Section 7 Mapper as potentially occurring in the action area. No critical habitat for these species has been designated in the area. Information regarding the potential for occurrence of each species in the action area or the vicinity of WFF is provided below. Although not identified by the ESA Section 7 Mapper as a species potentially occurring in the action area, the giant manta ray has been observed off the coast of Assateague Island (Swann 2018) and has been observed in estuarine waters, oceanic inlets, and bays.

Fish

Atlantic Sturgeon

There are five Distinct Population Segments (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 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. The Atlantic sturgeon is anadromous and estuarine-dependent. 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. 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 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 2021).

Although, the ESA Section 7 Mapper did not identify the giant manta ray as potentially occurring in the action area (NOAA Fisheries 2020e), this species has been observed off the coast of Assateague Island (Swann 2018), and it potentially could occur in the action area. However, given its rarity, its solitary and migratory behavior, and the lack of optimal habitat or food sources in the action area, the giant manta ray is extremely unlikely to occur in this area. It is unknown which life stages other than adult may be in the action area.

Sea Turtles

Leatherback Sea Turtle

The leatherback sea turtle mainly forages in the ocean but also in coastal waters in search of its soft-bodied prey, predominantly jellyfish. It is the most migratory and wide-ranging of all sea turtles. Although the leatherback is known to occur in the waters offshore of Accomack County, it has never been sighted swimming or nesting on the beaches at WFF (NASA 2019). Given the minimal habitat for the leatherback or its jellyfish prey in the action area, its potential to be present is likely to be limited to occasional transient adults or juveniles passing through the area from May through November.

Loggerhead Sea Turtle

The loggerhead sea turtle spends the majority of its life in the open ocean or nearshore coastal areas, foraging for mainly invertebrate prey such as crabs, whelks, and conch. It nests on beaches and occasionally on estuarine shorelines. NOAA Fisheries has divided the loggerhead population into nine DPSs, four that are threatened and five that are endangered. The population near WFF belongs to the federally threatened Northwest Atlantic DPS. NOAA Fisheries has designated 38 critical habitat areas within marine areas occupied by the northwest Atlantic DPS, and USFWS has identified 88 beaches from North Carolina to Mississippi as critical nesting habitat. None of these areas are in the vicinity of WFF. However, loggerhead nests have been observed on Wallops Island beaches as recently as 2013 (NASA 2021). The proposed action would not occur on or affect beaches potentially providing nesting habitat for the loggerhead sea turtle. Its potential to be present in the action area is likely to be limited to occasional transient adults or juveniles foraging in or migrating through the area from May through November.

Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle ranges as far north as Maine. It is found in oceanic and estuarine areas that typically contain muddy or sandy bottoms, where it feeds on crabs as well as mollusks, fish, and jellyfish. The Kemp's ridley nests on beaches from May to July, with 95% of the worldwide nesting of the Kemp's ridley occurring in the Mexican state of Tamaulipas. Occasional nests have been documented on the east coast of the United States, including the southeast coast of Virginia. The Kemp's ridley has never been directly observed at WFF. The species may occur offshore in relatively shallow waters (less than 50 m [160 ft]) in areas where habitat exists for prey species (NASA 2019). Given the lack of documented occurrences at WFF, its potential to occur in the action area is likely to be limited to occasional transient adults or juveniles foraging in or migrating through the area from May through November.

Green Sea Turtle

The green sea turtle is unique among marine turtles in that it feeds exclusively on plants, primarily sea grasses and algae. In the U.S., the green sea turtle primarily nests in June and July along the east coast of Florida, with lower occurrences of nesting northward to North Carolina. Green sea turtles use open ocean convergence zones and coastal areas for benthic feeding on sea grasses and algae. The green sea turtle has been directly observed in waters off WFF (NASA 2019). They are likely to inhabit the waters off WFF during the warmer months when sea grasses and algae are plentiful; however, nesting habitat occurs farther south. Given the minimal habitat for the green sea turtle in the action area, including the lack of seagrass beds, its potential to be present is likely to be limited to occasional transient adults or juveniles foraging in or migrating through the area from May through November.

Effects Determination

As shown in **Table 4**, each of the five federally listed marine species potentially occurring in the action area would be expected, if present, to be engaged in foraging and/or migrating through the area. However, as indicated by their life history characteristics and records for the WFF area, the potential for occurrence of any of these species in the action area is minimal and is expected to be limited to the occasional transient passage of individuals through the area during migration or while foraging. Only the Atlantic sturgeon is potentially present in the action area throughout the full year. Sea turtles are potentially present in the area only within a 7-month period (May through November), further limiting their potential for exposure and effects. The potential for effects on these species is discussed below.

Atlantic Sturgeon

It is possible, though unlikely, that Atlantic sturgeon could be affected by the Proposed Action. Recent studies 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., mouths of Chesapeake and Delaware Bays) 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 these activities were conducted, with the likelihood of encountering a sturgeon greatest during fall and early spring, which are times of peak migration (NASA 2019). Construction and operations activities under the Proposed Action potentially could affect Atlantic sturgeon if present in the action area as a result of pile-driving noise, vessel noise (including dredging noise), and turbidity due to sediment disturbance during construction and dredging.

Construction activities would not be anticipated to substantively affect migration or foraging behaviors of the Atlantic sturgeon. The inadvertent destruction or displacement of benthic species would be localized and would not substantially affect the quantity of benthic prey available in waters near the action area. The area of marsh and open water bottom beneath the pier would be approximately 0.4 hectare (ha) (1 acre [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 28.7 ha (71 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.

Pile-Driving Noise

Sturgeon and other special status marine species occurring in the inshore waters of the action area potentially could be affected by underwater noise caused by pier construction. The principal source of construction noise would be pile installation. Construction of the 190-m (624-ft) pier under Phase 1 would take approximately 12 months to complete, and construction of the 206-m (676-ft) pier extension under Phase 2 (for a total pier length of 398 m [1,305 ft]) would take approximately 9.5 months, with about 1 to 2 years between phases. 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.

The NOAA Fisheries Greater Atlantic Regional Fisheries Office (GARFO) developed a spreadsheet Acoustics Tool (GARFO 2020) for analyzing the effects of pile-driving in inshore waters on ESA-listed 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 action area. Based on the characteristics of the proposed pile-driving, information for a proxy project from the GARFO SAF spreadsheet is shown in **Table 5**. The estimated noise levels at the source associated with pile-driving for the Proposed Action, based on measurements for a proxy project (at a distance of 10 m [33 ft]), are presented in **Table 6** (GARFO 2020).

Table 5. Proxy Project for Estimating Underwater Noise

Project location	Water depth (m)	Pile size (in)	Pile type	Hammer type	Attenuation rate (dB/10 m)
Not available	5	24	concrete	impact	5

m = meters; in = inches; dB = decibels
Source: GARFO (2020)

Table 6. Proxy-Based Estimates for Underwater Noise Level at the Source

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)
24-in concrete	impact	185	170	160

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: GARFO (2020)

The GARFO SAF model was used to estimate the distances from pile-driving activities at which thresholds for noise-related effects would be exceeded. Effects can range from behavioral changes/disturbance to physical injury. Because sound (noise) consists of variations in pressure, the unit for measuring sound is referenced to a unit of pressure, the Pascal (Pa). A decibel (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 sound exposure levels (SELs) also are expressed in decibels.

The thresholds for effects vary among types of organisms. Effect thresholds have been identified by NOAA Fisheries for fish (including sturgeon), sea turtles, and marine mammals. For sturgeon, the estimated distances at which pile-driving noise would equal or exceed injury or behavioral threshold levels are shown in **Table 7**.

Table 7. Estimated Distances to Sturgeon Injury and Behavioral Thresholds

Pile type	Hammer type	Distance to injury threshold (SPL_{peak} = 206 dB re 1 µPa)	Distance to injury threshold (SEL_{cum} = 187 dB re 1 µPa²s)	Distance to behavioral threshold (SPL_{rms} = 150 dB re 1 µPa)
24-in concrete	impact	NA	30 m	50 m

m = meters; in = inches; 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; NA = not applicable because source level is less than or equal to threshold level
Source: GARFO (2020)

The peak exposure criterion (SPL_{peak} = 206 dB re 1 Pa) for sturgeon is related to the energy received from a single pile strike. The potential for injury also exists from multiple exposures to noise over a period of time, which is accounted for by the SEL_{cum} threshold (SEL_{cum} = 187 dB re

1 μPa^{2}s). The SEL_{cum} is not an instantaneous maximum noise level but is a measure of the accumulated energy over a specific period of time (e.g., the period of time it takes to install a pile). The farther away a fish is from the pile being driven, the more strikes it must be exposed to for enough energy to accumulate to result in injury. For behavioral effects, the exposure criterion for sturgeon is expressed as a root-mean-square sound pressure level (SPL_{rms}= 150 dB re 1 μPa).

Exposure to impulsive underwater noise levels of 206 dB re 1 μPa (SPL_{peak}) or 187 dB re 1 μPa^{2}s (SEL_{cum}) can result in injury to sturgeon.

As shown in **Table 7**, 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_{cum} exposure criterion, injury to a sturgeon potentially could occur if the fish remained within 30 m (98 ft) while the pile was being driven. In order to be exposed to potentially injurious levels of noise during installation of the piles, a sturgeon would need to remain within 30 m (98 ft) of the pile during the time it is being driven in order to be exposed to this SEL_{cum} threshold. 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 (165 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 (100 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 (165 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 ensonified area. The waterway at the location where the pier would be constructed is approximately 1.6 kilometer (km; 1 mile) wide, providing extensive habitat in which a sturgeon could avoid the ensonified area. It is extremely unlikely that these movements will affect essential sturgeon behaviors such as spawning, foraging, resting, or migration. The action area is not sturgeon spawning habitat, and the bays and waterways of the area are sufficiently extensive to allow sturgeon to avoid the ensonified area 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.

Mitigation Measures for Underwater Noise from Pile-Driving

A soft-start procedure would be used for pile-driving to allow sturgeon that may be in the action 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. 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 calculation of threshold distances using the GARFO SAF spreadsheet model. The model results indicated a lack of significant effects without a bubble curtain.

Vessel Noise

Noise generated by vessels during project construction or vessels calling on the pier during its operation potentially could affect sturgeon in the action 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. Large ships tend to be noisier than small ones, and ships with a full load (including towing or pushing a load) tend to be noisier than unloaded vessels. Vessel noise is a combination of narrow-band (tonal) sound and broadband sound. The intensity of noise produced is approximately related to the size and speed of the vessel. Individual vessels may generate very different sound levels and have different frequency characteristics depending on factors such as the propulsion system and whether there is propeller cavitation or singing (Spiga et al. 2012).

Noise from vessels traveling to and from the pier potentially would cause behavioral disturbance to sturgeon but would not result in injury. Smaller ships such as tugs or trawlers produce broadband noise with a source level (SPL) of typically 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 (3.3 ft) (Spiga et al. 2012). These SPLs at 1 m (3.3 ft) are less than the sturgeon noise response criteria for injury and greater than the sturgeon noise response criterion for non-impulsive behavioral effects (**Table 7**). However, a sturgeon would need to be in relatively close proximity to the vessel to experience sound levels that exceed the 150 dB re 1µ Pa behavioral effect threshold.

Impacts from vessel noise would not cause physical injury to sturgeon. 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 waterway in the channel varies, with the most narrow spot approximately 0.5 km (0.35 mile) wide and, similar to noise avoidance from pile-driving, there is sufficient habitat to allow a sturgeon to avoid the ensonified area.

Noise from dredging vessels and associated equipment and operations was evaluated by NMFS in a 2012 Biological Opinion, which concluded that the effects of dredge noise on whales are discountable (NASA 2018). Similarly, the numbers of sturgeon in the 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 vessel noise from construction or operation of the Proposed Action also would be discountable, and any potential effects would be insignificant.

Vessel Strikes

Where there is overlap between vessel traffic and Atlantic sturgeon habitat, there is the possibility of vessel strikes, which potentially can result in injury or mortality. The dredging of the new channel and turning basin during the construction phases of the Proposed Action would increase vessel traffic in the action area during dredging operations. The use of the navigation channel and turning basin during operation of the proposed port would result in additional vessels transiting through the action area in the future. Any increases in vessel traffic may not directly correlate to more vessels in the action 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. The use of dredging vessels would be intermittent, temporary, and restricted to a small portion of the overall action area on any day that dredging occurs.

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 action area; the low baseline risk of vessel strikes in the area; and the extremely small, intermittent increase in vessel traffic that would be added to existing traffic in the area as a result of the Proposed Action. Given that the number of sturgeon in the action area is small, the risk of vessel strike is extremely low. Additionally, vessels entering the inlet would slow down, further reducing the probability of vessels strikes. It is estimated that, although there may be a slight increase in risk from the minimal number of additional vessels added to baseline activity in the action area during construction and operations, any associated increase in risk of vessel strikes would be extremely small and, therefore, discountable.

Turbidity

Pile-driving for pier construction, dredging of the channel and turning basin, and placement of dredged sediment, would cause temporary increases in suspended sediment, thereby increasing local turbidity. 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 mg/L above background levels within approximately 91 m (300 ft) of the pile being driven (NOAA Fisheries 2022). 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 milligrams per liter. 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 2020).

During dredging operations, sediment disturbance and TSS concentrations typically vary depending on factors such as the equipment used, currents, and tides. For the Proposed Action, mechanical dredges (e.g., clamshell) would be used during channel and turning basin dredging. TSS concentrations associated with clamshell bucket dredging operations 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, USACE conducted extensive monitoring of mechanical dredge plumes and found that plumes dissipated to background levels within approximately 180 m (600 ft) of the source in the upper water column and 730 m (2,400 ft) in the lower water column regardless of bucket type (NOAA Fisheries 2022). 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 730-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 2020).

High TSS levels can cause a reduction in dissolved oxygen levels. Sturgeon may become stressed when dissolved oxygen falls below certain levels. A study in 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 2022). 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. TSS is most likely to affect sturgeon if a plume causes a barrier to normal behaviors. However, sturgeon would be expected to swim through the plume to avoid the area with no adverse effects (NOAA Fisheries 2020).

Increased turbidity from construction activities would likely be short-lived, and with proper, required controls, such as turbidity curtains (sediment curtains), turbidity impacts would be reduced. If the use of turbidity curtains is not possible during dredging due to current velocities, dredging would be conducted during slack tides (i.e., on the western portion of the channel during flood tides and the eastern portion of the channel during ebb tides). Sediment plumes from construction would likely settle out in a few hours, limiting effects from increased turbidity to the short-term. Increased turbidity has the potential to temporarily impact foraging habitat for the Atlantic sturgeon, and sturgeon may avoid the locally affected area entirely if the sediment load is extremely high. A relatively limited area potentially would be affected temporarily, and extensive areas of unaffected foraging habitat would remain available in the waterways of the action area. Thus, the overall likelihood of the Atlantic sturgeon being adversely affected by turbidity from construction or operation of the Proposed Action would be discountable, and any potential effects would be insignificant.

Capture/Entrapment During Dredging

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 (Hopper 2021). 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).

Based on the best available information, the mobility of the sturgeon, and the small size of the area to be dredged, 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, therefore, discountable (Hopper 2021).

Effects Determination for Atlantic Sturgeon

The Proposed Action may affect but is not likely to adversely affect Atlantic sturgeon if present in the action area.

Giant Manta Ray

The giant manta ray is rare, solitary, and migratory, and the action 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 discountable, and any potential effects would be less than significant.

Effects Determination for Giant Manta Ray

Thus, the Proposed Action may affect but is not likely to adversely affect the giant manta ray.

Sea Turtles

The time of year when activities occur under the Proposed Action affects the chances for impacts to sea turtles. As shown in **Table 4**, sea turtles potentially occur in the action area only during the seven months of the year when water temperatures are warmest (May through November). Activities occurring in the other five months would have no effect on sea turtles. Construction and operations activities under the Proposed Action potentially could affect sea turtles if present in the action area as a result of pile-driving noise, vessel noise (including dredging noise), vessel strikes, and turbidity due to sediment disturbance during construction and dredging.

Pile-Driving Noise

As discussed for sturgeon, the NOAA Fisheries GARFO Acoustics Tool (GARFO 2020) for analyzing the effects of pile-driving in inshore waters on ESA-listed species was used to evaluate potential underwater noise impacts on sea turtles from pile-driving during construction of the Proposed Action. The GARFO SAF spreadsheet model was used to estimate the ensonification area from pile-driving in the shallow, inshore bays and waterways of the action area. Based on the characteristics of the proposed pile-driving, information for a proxy project from the GARFO SAF spreadsheet is shown in **Table 5**. The estimated noise levels at the source associated with pile-driving for the Proposed Action, based on measurements for a proxy project (at a distance of 10 m [33 ft]), are presented in **Table 6** (GARFO 2020).

The thresholds for effects vary among types of organisms. Effect thresholds have been identified by NOAA Fisheries for fish, sea turtles, and marine mammals. For sea turtles, the estimated distances at which pile-driving noise would equal or exceed injury or behavioral threshold levels are shown in **Table 8**.

Table 8. Estimated Distances to Sea Turtle Injury and Behavioral Thresholds

Pile type	Hammer type	Distance to injury threshold (SPL_{peak} = 226 dB re 1 μPa for TTS, = 232 dB re 1 μPa for PTS)	Distance to injury threshold (SEL_{cum} = 189 dB re 1 μPa^{2}s for TTS, = 204 dB re 1 μPa^{2}s for PTS)	Distance to behavioral threshold (SPL_{rms} = 175 dB re 1 μPa)
24-in concrete	Impact	NA	NA	NA

m = meters; in = inches; dB re 1 μPa = sound exposure level in decibels relative to 1 microPascal; dB re 1 μPa^{2}s = 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; TTS = temporary threshold shift; PTS = permanent threshold shift; NA = not applicable because source level is less than or equal to threshold level
Source: GARFO (2020)

A loss of hearing sensitivity (i.e., an elevated hearing threshold) may result from exposure to sound of sufficient SPL and duration. Such a loss of hearing sensitivity is referred to as a noise-induced threshold shift (TS). If the hearing threshold eventually returns to normal, the TS is referred to as a temporary threshold shift (TTS). If the threshold remains elevated after an extended period of time, the TS that remains is referred to as a permanent threshold shift (PTS). TTS and PTS criteria and thresholds are used to predict auditory effects in sea turtles exposed to underwater noise, which is similar to their use in the development of safe noise exposure guidelines for people in noisy environments. TTS is defined as a temporary, reversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level, and PTS is defined as a permanent, irreversible increase in this threshold (NOAA Fisheries 2018).

Exposure to impulsive underwater noise levels of 232 dB re 1 µPa (SPL_{peak}) or 204 dB re 1 $µPa^2s$ (SEL_{cum}) can result in PTS injury to sea turtles, and exposure to lower levels can result in TTS. As shown in **Table 8**, 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. Thus, the effects of pile-driving noise on sea turtles during construction of the Proposed Action would be insignificant.

Mitigation Measures for Underwater Noise from Pile-Driving

A soft-start procedure would be used for pile-driving to allow sea turtles that may be in the action area to detect the presence of noise-producing activities and to 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 location and be monitored for the presence of sea turtles, has been cleared. A bubble curtain around each pile being driven could be used for noise attenuation. 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 calculation of threshold distances using the GARFO SAF spreadsheet model.

Vessel Noise

As described above for sturgeon, noise generated by vessels during project construction or vessels calling on the pier during its operation potentially could affect sea turtles in the action area. Smaller ships such as tugs or trawlers produce broadband noise with a source level (SPL) of typically 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 (3.3 ft) (Spiga et al. 2012). These

SPLs at 1 m (3.3 ft) are less than the sea turtle noise response criteria for injury (**Table 8**), and those for smaller ships 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 in close proximity to 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.

Noise from dredging vessels and associated equipment and operations was evaluated by NMFS in a 2012 Biological Opinion, 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 action area are very low, and it is extremely unlikely for a sea turtle to occur close enough to the dredge area to be disturbed by noise. In addition, mitigation measures would be employed through the use of protected species observers, which can halt dredging operations when a sea turtle is observed within a minimum defined distance (e.g., 1 km [0.5 nautical mile]) of the dredge (NASA 2018). Thus, the overall likelihood of a sea turtle being adversely affected by vessel noise from construction or operation of the Proposed Action would be discountable, and any potential effects would be insignificant.

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 action 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 action 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, temporary, and restricted to a small portion of the overall action area on any day that dredging occurs. 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).

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 action area; the low baseline risk of vessel strikes in the area; and the extremely small, intermittent increase in vessel traffic that would be added to existing traffic in the area as a result of the project. Given that the presence of sea turtles in the action 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, and would operate at idle/no wake speeds in project construction areas, further reducing the probability of vessels strikes. At this time, we assume 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 that any associated increase in vessel strikes on sea turtles would be extremely small and, therefore, discountable.

Turbidity

Pile-driving for pier construction, dredging of channels and turning basins, and placement of dredged sediment would cause temporary increases in suspended sediment, thereby increasing local turbidity. Increased turbidity from construction activities would likely be short-lived. Controls, such as turbidity curtains (sediment curtains), may reduce turbidity impacts. 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 tides and the eastern portion of the channel during ebb tides) to lessen turbidity. Sediment plumes from construction would likely settle out in a few hours, limiting effects from increased turbidity to the short-term.

No information is available on the effects of TSS on juvenile and adult sea turtles. 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. Sea turtles breathe air at the water’s surface and would be able to swim away from the turbidity plume and would not be adversely affected by passing through areas affected by the temporary increase in TSS. 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 or around the plume to avoid the area with no adverse effects. For these reasons, physical and behavioral turbidity effects on sea turtles would be too small to be meaningfully measured or detected, and would be insignificant (NOAA Fisheries 2020).

Capture/Entrapment During Dredging

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. Based on this information, effects to sea turtles from the mechanical dredge are discountable (Hopper 2021).

Effects Determination for Sea Turtles

The Proposed Action may affect but is not likely to adversely affect sea turtles if present in the waters of the action area.

Conclusions

The effect determinations for each species discussed above are summarized in **Table 9**.

Table 9. Effects Determinations for Species Under NOAA Fisheries Jurisdiction Potentially Occurring in the Action Area			
Common Name	**Listing Status**	**DPS**	**Effect Determination**
Atlantic sturgeon	Threatened/ Endangered	All	May affect, not likely to adversely affect
Giant manta ray	Threatened	N/A	May affect, not likely to adversely affect
Leatherback sea turtle	Endangered	N/A	May affect, not likely to adversely affect
Loggerhead sea turtle	Threatened	Northwest Atlantic	May affect, not likely to adversely affect
Kemp's ridley sea turtle	Endangered	N/A	May affect, not likely to adversely affect
Green sea turtle	Threatened	North Atlantic	May affect, not likely to adversely affect

Notes:
DPS = Distinct population segment
N/A = Not applicable

Based on the analysis that all effects of the Proposed Action would be insignificant and/or discountable, we have determined that the Wallops Island Northern Development Project may affect but is not likely to adversely affect any listed species or critical habitat under NOAA Fisheries' jurisdiction. We certify that we have used the best scientific and commercial data available to complete this analysis. We request your concurrence with this determination.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Sincerely,

Shari A. Miller
Center NEPA Manager and
Environmental Planning Lead

Enclosures
Attachment 1, Geotechnical Report for MARS Port
Attachment 2, NOAA ESA Section 7 Mapper

cc:
250/Ms. K. Finch
250/Mr. T. Meyer
MARAD/Mr. A. Finio
NMFS/Mr. D. O'Brien
NMFS/Mr. B. Hopper
USACE/Mr. S. Bahnson
VCSFA/Mr. A. Brittingham

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ATTACHMENT 1: GEOTECHNICAL REPORT

HYNES

JOHN D. HYNES & ASSOCIATES, INC.

Geotechnical and Environmental Consultants
Monitoring Well Installation
Construction Inspection and Materials Testing

March 31, 2021

William A. Murchison
Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland 21237

Re: Report of Subsurface Exploration and Geotechnical Consulting Services
Wallops Island M95 Intermodal Barge Service Project
Wallops Island, Virginia
Project No.: JDH-10/20/145

Dear Mr. Murchison:

John D. Hynes & Associates, Inc. has completed the authorized subsurface exploration and geotechnical engineering evaluations for the proposed Wallops Island M95 Intermodal Barge Service project located in Wallops Island, Virginia. Our services were performed, generally, in accordance with our contract dated September 12, 2019.

This report describes the exploration methods employed, exhibits the data obtained, and presents our evaluations and recommendations with regard to dock pile foundations. The report includes a discussion of the field work, the soil and groundwater conditions encountered during the exploration for the dredging and deepening of the proposed Wallops channel and turning basin and the construction of barge deck. The barge deck is to be supported on deck pier bents and pier bents are supported on pier bent pile foundations. We provide recommendations for vertical and battered piles for pier bent pile foundations for the proposed Wallops Island M95 Intermodal Barge Service project.

We appreciate the opportunity to be of service to you. If you have any questions regarding the contents of this report or if we may be of further assistance, please contact our office.

Respectfully,
JOHN D. HYNES & ASSOCIATES, INC.

Duowen Ding
Project Engineer

John D. Hynes, P.E.
President

DD: JDH/jsl

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Email: jdh@jdhynesinc.com

HYNES

REPORT OF
SUBSURFACE EXPLORATION
AND
GEOTECHNICAL CONSULTING SERVICES

WALLOPS ISLAND M95 INTERMODAL BARGE SERVICE PROJECT
WALLOPS ISLAND, VIRGINIA

PREPARED FOR
GAHAGAN & BRYANT ASSOCIATES, INC.

MARCH 31, 2021
PROJECT NO.: JDH-10/20/145

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PURPOSE AND SCOPE

The subsurface exploration study was performed to evaluate the subsurface conditions with respect to the following:

1. Soil and groundwater conditions encountered at the site;
2. Channel deepening and dredging;
3. Pier bent pile foundation capacities and installation depths;
4. Pile foundation construction and inspection procedures;
5. Location of groundwater and Chincoteague Bay water; and
6. Other aspects of the design and construction for the proposed structures indicated by the exploration.

An evaluation of the site is included. The inspection is considered necessary both to confirm the subsurface conditions and to verify that the soils related construction phases are performed properly.

EXISTING SITE CONDITIONS

As shown on the Project Location Map (Drawing JDH-10/20/145-A) in the Appendix, the project site is located at the Wallops Island, Virginia. The site includes an on land side area, a marsh area and a water side (mud and overdredge) area. The on land side area is beyond the end of the pavement/runway at the edge of the marsh. The marsh area is generally surrounded by the runway and Chincoteague Bay water. The water side area is along the water channel and turning basin in the Chincoteague Bay. The site includes on land side, marsh, water side areas and is generally along the shoreline of Chincoteague Bay water and Wallops Island.

PROJECT CHARACTERISTICS

Proposed for development on the site is the construction of Wallops Island M95 Intermodal barge service waterfront facilities. Hynes & Associates evaluated the site for the deck foundations. The deck will be supported on bents which are, in turn, supported on pile foundations. Based on information provided by the WBCM, LLC, we understand that the maximum compression load of 140 tons and the maximum uplift load of 90 tons will be considered in the pile analyses. Piles considered for support are 24 inches square prestressed concrete piles and 20 inches square prestressed concrete piles. We understand that the Phase 1 mudline depth at Boring P-3 is -10.3 NAVD88. The Phase 3 mudline depth at Boring P-5 is -13.3 NAVD88. We have evaluated 24 inch and 20 inch square vertical and battered piles to support the pier bent deck. We will provide recommendations for alternative foundations, upon request.

FIELD EXPLORATION AND STUDY

In order to determine the nature of the subsurface conditions at the site, sixteen (16) test borings, designated as L-1, P-1 through P-5, D-2, D-4, D-6, D-9, D-11, D-13, D-15, E-2, E-4, and E-7, were drilled on November 13, 2020 to January 5, 2021, at the approximate locations shown on the Exploration Location Plan (Drawing JDH-10/20/145-B) in the Appendix. Land test boring L-1 was drilled to a depth of 90.5 feet below existing grade. Pier test borings P-1 through P-5 were drilled to depths of 90.5 to 120.5 feet below existing grade. Channel deepening test borings D-2, D-4, D-6, D-9, D-11, D-13, and D-15 were drilled to depths of 4 to 18 feet below existing grade. Dredging test borings E-2, E-4 and E-7 were drilled to depths of 8 feet below existing grade. The test borings were drilled using track-mounted Geoprobe 3230 and 7822 DT drill rigs, and a Mobile B-47 HD drill rig.

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Soil sampling and testing were carried out in accordance with ASTM Specification D-1586. A brief description of the field procedures is included in the Appendix. The results of all boring and sampling operations are shown on the boring log in the Appendix.

Samples of the subsurface soils were examined by our engineering staff and were visually classified in accordance with the Unified Soil Classification System (USCS) and ASTM Specification D-2488. The estimated USCS symbols appear on the boring log and a key to the system nomenclature is provided in the Appendix of this report. Also included are reference sheets which define the terms and symbols used on the boring log and explain the Standard Penetration Test procedures.

We note that the test boring records represent our interpretation of the field data based on visual examination and selected soil classification tests. Indicated interfaces between materials may be gradual.

The field exploration data was supplemented with laboratory testing data. The laboratory at John D. Hynes & Associates, Inc. performed six (6) moisture content tests, fourteen (14) particle size distribution tests including ten (10) hydrometer tests, and eleven (11) Atterberg limits test. The test results are presented in a table in the Appendix.

We collected two Shelby tubes in a soft cohesive soil layers. A third Shelby Tube was attempted at 32 to 34 feet in Boring P-4. The sampling retrieved in no recovery. Two tube samples was sent to EBA Engineering in Laurel, Maryland for unconfined compressive strength testing, unit weight determination, moisture content testing, and Atterberg Limits testing. The samples were taken at 22 to 24 in Boring L-1 and 42 to 44 in Boring P-5. The Shelby tube sample L-1 from Boring L-1 at depths 22 to 24 feet was very soft and could not stand properly to be tested. So, EBA could not perform UU-triaxial test on the Shelby tube sample L-1. EBA performed the other tests on the Shelby tube sample L-1 except the UU-triaxial test. Shelby tube test results and sample identifications, locations and depths are included in the Appendix. The EBA Engineering data sheets are included in the Appendix.

Six pressuremeter tests were performed by In-Situ Soil Testing, L.C. in the field at locations P-2 and P-2A. The test at 12.9 feet at B-2 was rerun at B-2A at 14 feet because the data was in question. The data was verified. The results of this testing are included in the Appendix of this report.

SUBSURFACE CONDITIONS

At the time of our field work, 6 inches of organic bearing soil was encountered at the ground surface at the boring location L-1. Sediments were encountered at the other boring locations. Varying thicknesses of organic bearing soils or other surficial materials in varying thicknesses may be encountered at other locations on site.

The soils encountered were visually classified in accordance with the USCS and consisted of interbedded layers of SAND (SP and SP-SM), Silty SAND (SM), Clayey SILT (ML and ML-MH), Clayey Elastic SILT (MH), Clayey Organic SILT (MH-OH), CLAY and SAND (CL-SC), CLAY (CL), Silty CLAY and Fat CLAY (CL-CH), and Silty Fat CLAY (CH) to the boring termination depths. Standard Penetration Test (SPT) values (N-values) in the sand layers ranged from 2 to 47 blows per foot, indicating in-place relative densities of very loose to dense. The SPT values in the cohesive soil layers ranged from 3 to more than 91 blows per foot, indicating in-place consistencies of very soft to hard.

Groundwater was encountered at depths of 3 feet below the ground surface during drilling operations at Boring L-1. Groundwater elevations may vary at other times during the year depending upon the amount of local precipitation, tidal fluctuations in the Chincoteague Bay at boring L-1. The water level in the Bay was at grade in boring P-1 at the

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time the boring was drilled. Water depths varied from 2.25 feet to 16 feet in the other test borings that were drilled from a barge.

RECOMMENDATIONS

The following recommendations and considerations are based on our understanding of the proposed construction, the data obtained from the exploration, and our previous experience with similar subsurface conditions and projects. If there are any significant changes to the project characteristics, such as structural loadings differing significantly from those noted above, structure geometry, structure location, foundation type, elevations, etc., we request that this office be advised so the recommendations of this report can be re-evaluated.

A. Turning Basin and Channel Deepening and Dredging

Deepening and dredging for the construction of the proposed channel and turning basin will be required. Based on boring information, it is anticipated that the depth of deepening and dredging in earth materials will likely be up to 8 to 18 feet deep. The materials that will be encountered in the deepening and dredging include SAND (SP and SP-SM), and CLAY and SAND (CL-SC) materials. Standard Penetration Test (SPT) values (N-values) in the sand layers ranged from 3 to 37 blows per foot, indicating in-place relative densities of very loose to dense. It is anticipated that earth deepening and dredging can generally be performed using conventional deepening and dredging equipment in proper working condition.

B. Driven Prestressed Concrete Piles

Based on the proposed loads and subsurface soil conditions at the site, we recommend supporting the deck pier bents on prestressed concrete pile foundations. Hynes & Associates' pile recommendations are based upon local site characteristics, the subsurface soil parameters determined from the field exploration, pressuremeter test results and the physical characteristics of the piles. We provide recommendations for 24 inch square and 20 inch square prestressed concrete piles. Assuming conformance to the embedment requirements, the assigned pile capacities may be used by the Structural Engineer for pile spacing according to the structure design and the loads to be applied. Total elastic settlement of the piles is anticipated to be less than ½ inch. Considering the subsurface soil characteristics and the parameters used in our assignment of pile embedments, long term settlement of the pile foundations is expected to be minimal if the recommendations of this report are followed. The pile properties are shown in the Appendix (Drawing JDH-10/20/145-D. We understand that the Phase 1 mudline depth at Boring P-3 is -10.3 NAVD88. The Phase 3 mudline depth at Boring P-5 is -13.3 NAVD88.

Based upon the above, we will provide pile embedments and allowable capacities of prestressed concrete piles with square sections, dimensions of 24 in. by 24 in. and 20 in. by 20 in. the land side area, marsh and water areas. The pile capacities will be presented in a supplement to this report.

The compression design capacity of each prestressed concrete pile production pile should be confirmed by the geotechnical engineer or an experienced pile inspector during the pile driving operations by using an acceptable pile driving formula such as the Engineering News Formula. In instances where the design capacity cannot be obtained within the production pile lengths, additional piles would be required.

The characteristics of the prestressed concrete pile groups should be designed for adequate structural requirements as specified by the Structural Engineer. These requirements should include the strengh of the piles under static, dynamic, uplift and lateral loads, where applicable.

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The installation of all piles should be in accordance with local code requirements. In addition, the installation of all piles should be inspected by a qualified Geotechnical Engineer or foundation inspector. The inspector should verify and record all aspects of the installation including pile sizes, pile length before driving, cut-off length, tip installation depth and the driving data.

We recommend that at least one pile load test be performed for each capacity of vertical pile at locations as decided by the Structural and Geotechnical Engineers. The pile load test should be in accordance with ASTM D-1143 Standard Test Method for Piles Under Static Axial Compressive Load. The piles should be loaded to 200 percent of the design load. The load tests should be required to verify the capacity of the piles at the selected embedment depth and capacity. As an alternative, Dynamic Pile Load testing may be performed.

ADDITIONAL SERVICES RECOMMENDED

Additional engineering, testing and consulting services recommended for this project are summarized below.

Driven Pile Inspections

The Geotechnical Engineer should verify all driven length embedments. The geotechnical engineer or experienced foundation inspector should verify and record all aspects of installation including pile dimensions, pile length, tip elevation, top elevation and the driving data. The inspecting engineer should verify that the driving data indicates that the design compression, uplift, and lateral capacity of each pile had been achieved.

REMARKS

This report has been prepared solely and exclusively for Gahagan & Bryant Associates, Inc. to provide guidance to design professionals in developing facilities plans for the proposed Wallops Island M95 Intermodal Barge Service Project located in Wallops Island, Virginia. It has not been developed to meet the needs of others, and application of this report for other than its intended purpose could result in substantial difficulties. The Consulting Engineer cannot be held accountable for any problems which occur due to the application of this report to other than its intended purpose.

These analyses and recommendations are, of necessity, based on the concepts made available to us at the time of the writing of this report, and on-site conditions, surface and subsurface that existed at the time the exploratory borings were drilled. Further assumption has been made that the limited exploratory borings, in relation both to the areal extent of the site and to depth, are representative of conditions across the site. It is also recommended that we be given the opportunity to review all plans for the project in order to comment on the interaction of soil conditions as described herein and the design requirements.

Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with generally accepted engineering principles and practices.

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APPENDIX

1. Investigative Procedures
2. Project Location Map
3. Boring Location Plan
4. Proposed Pier Plan and Elevation
5. Pile Properties Sketch
6. Boring Logs
7. Hynes & Associates: Grain Size Distribution Graphs
8. EBA: Soil Testing
9. Pressuremeter Test Results
10. Unified Soil Classification Sheet
11. Field Classification Sheet
12. Important Information Sheet

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INVESTIGATIVE PROCEDURES

SOIL TEST BORINGS

Soil drilling and sampling operations were performed in accordance with ASTM Specification D-1586. The borings were advanced by mechanically turning continuous hollow stem auger flights into the ground. At regular intervals, samples were obtained with a standard 1.4 inch I.D., 2.0 inch O.D. splitspoon sampler. The sampler was first seated 6 inches to penetrate any loose cuttings and then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot is the "Standard Penetration Resistance". The penetration resistance, when properly evaluated, is an index to the soil's strength, density and behavior under applied loads. The soil descriptions and penetration resistances for each boring are presented on the Test Boring Records in the Appendix.

SOIL CLASSIFICATION

Soil classifications provide a general guide to the engineering properties of various soil types and enable the engineer to apply his past experience to current problems. In our investigation, jar samples obtained during drilling operations are examined in our laboratory and visually classified by the geotechnical engineer in accordance with ASTM Specification D-2488. The soils are classified according to the Unified Classification System (ASTM D-2487). Each of these classification systems and the in-place physical soil properties provides an index for estimating the soil's behavior.

SIEVE ANALYSIS

Gradational analysis tests were performed to determine the particle size and distribution of the samples tested. The grain size distribution of soils coarser than a No. 200 sieve is determined by passing the sample through a standard set of nested sieves. The percentage of materials passing the No. 200 sieve is determined by washing the material over a No. 200 sieve. These tests are in accordance with ASTM D-421, D-422 and D-1140. The results are presented in the Appendix to our report.

NATURAL MOISTURE

Portions from representative soil samples obtained during drilling operations were selected for Natural Moisture Content tests. The Natural Moisture Content Test determines the water content of soils by drying into an oven with a standard drying temperature of 110°C. The lost of mass drying the sample, determines the water content into the soil. The water content of the sample is calculated in percentage. The water content of soils (natural moisture) is determined in accordance with ASTM Specification D-2216.

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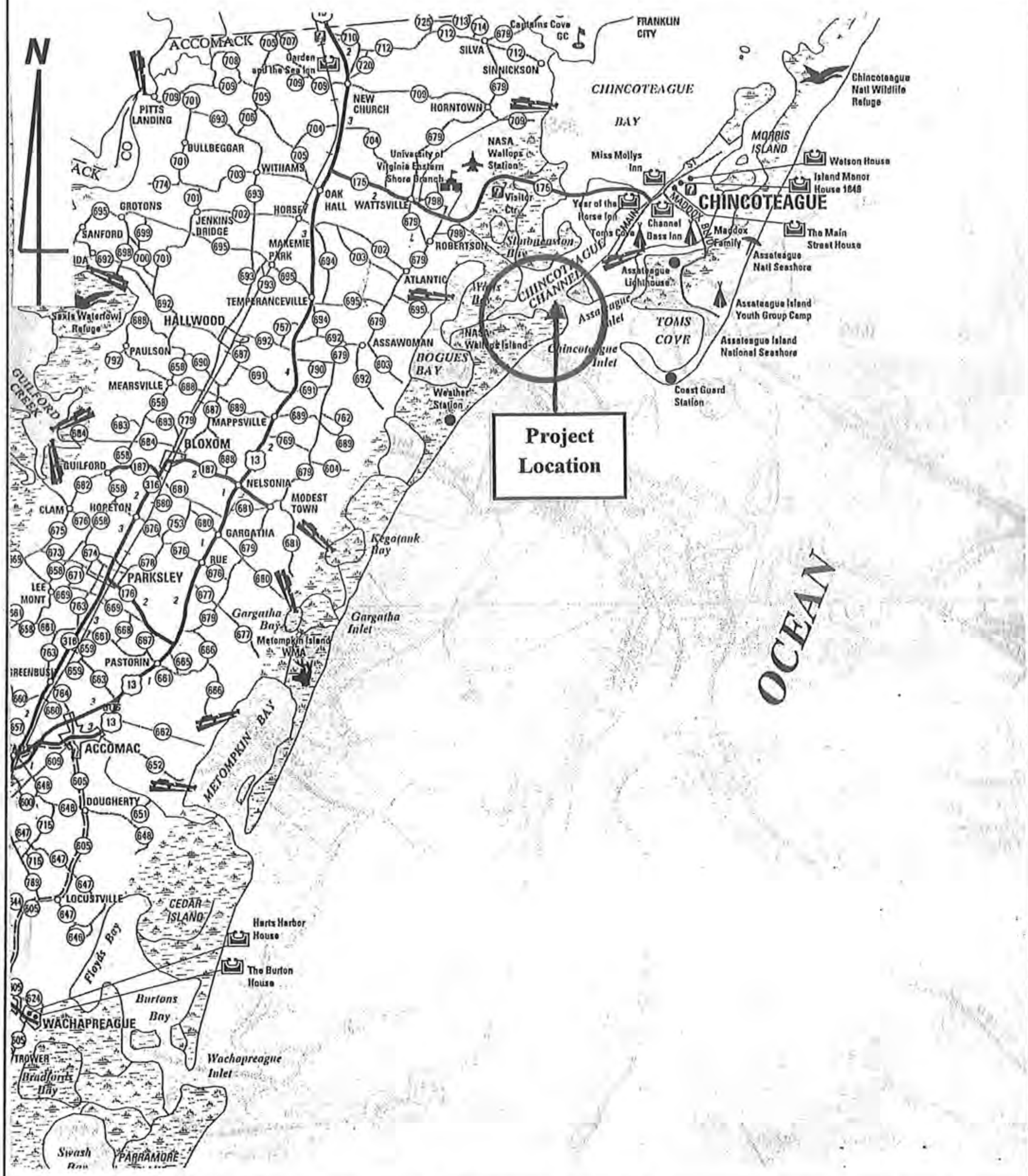

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Date: November 25, 2020	
Scale: 1 in. = 2,000 ft.	
Drawn: ADC Map	

Project Location Map
Wallops Island M95 Intermodal Barge
Wallops Island, Virginia

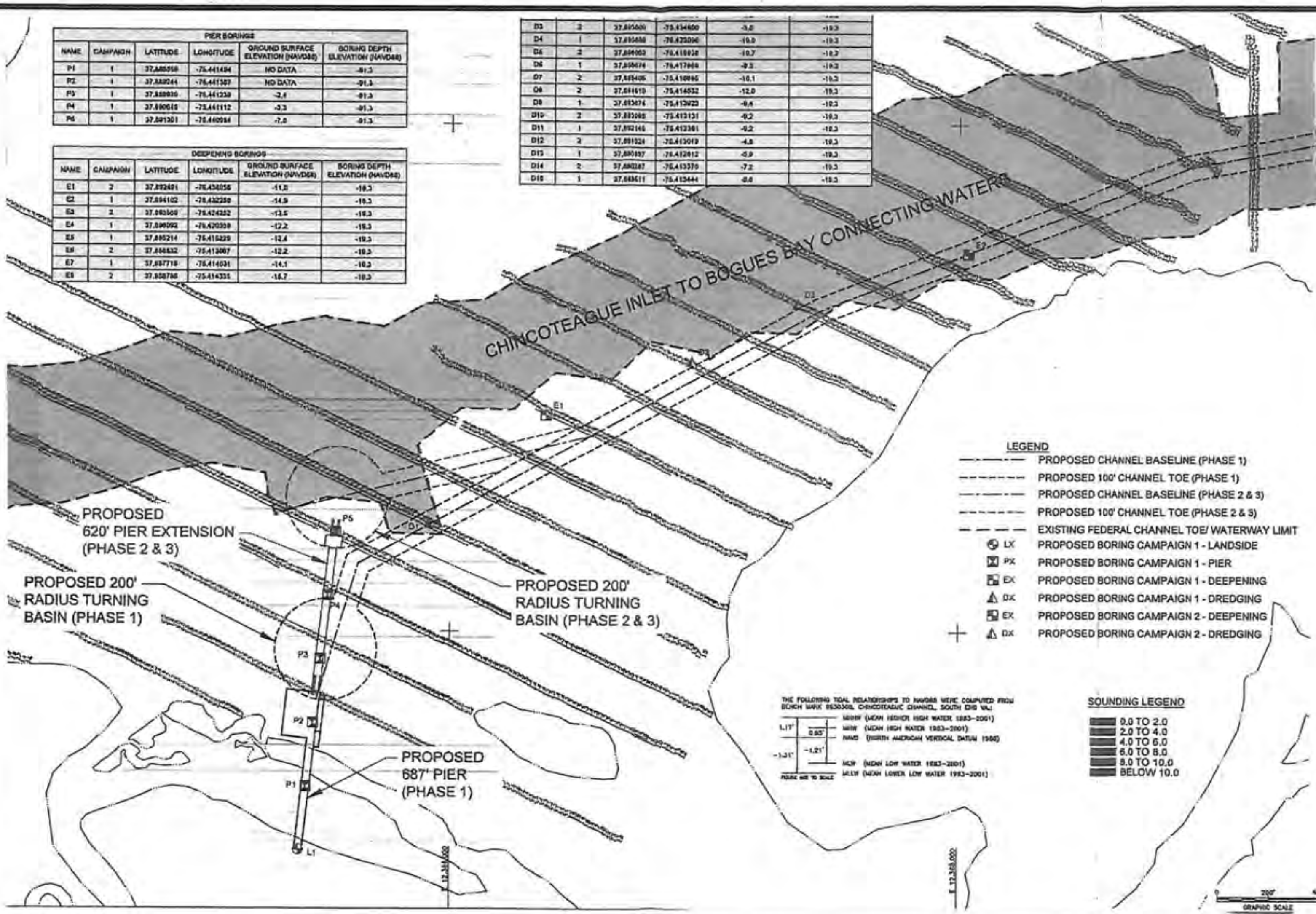
DWG. No.

JDH-10/20/145-A

PIER BORINGS					
NAME	CAMPAIGN	LATITUDE	LONGITUDE	GROUND SURFACE ELEVATION (NAVD88)	BORING DEPTH ELEVATION (NAVD88)
P1	1	37.889058	-75.441494	NO DATA	-91.3
P2	1	37.889044	-75.441387	NO DATA	-91.3
P3	1	37.889930	-75.441230	-2.4	-91.3
P4	1	37.890640	-75.441112	-3.3	-91.3
P5	1	37.891301	-75.440984	-7.8	-91.3

DEEPENING BORINGS					
NAME	CAMPAIGN	LATITUDE	LONGITUDE	GROUND SURFACE ELEVATION (NAVD88)	BORING DEPTH ELEVATION (NAVD88)
E1	2	37.892491	-75.438056	-11.8	-19.3
E2	1	37.894102	-75.432250	-14.9	-19.3
E3	2	37.893509	-75.424252	-13.5	-19.3
E4	1	37.896092	-75.420359	-12.2	-19.3
E5	1	37.895214	-75.418229	-12.4	-19.3
E6	2	37.896832	-75.413967	-12.2	-19.3
E7	1	37.897719	-75.414031	-14.1	-19.3
E8	2	37.898780	-75.414335	-16.7	-19.3

D3	2	37.893000	-75.434600	-3.8	-19.3
D4	1	37.893688	-75.423096	-10.0	-19.3
D5	2	37.896003	-75.418838	-10.7	-19.3
D6	1	37.896674	-75.417968	-9.3	-19.3
D7	2	37.889406	-75.416995	-10.1	-19.3
D8	2	37.891610	-75.414032	-12.0	-19.3
D9	1	37.893074	-75.413923	-9.4	-19.3
D10	2	37.893088	-75.413131	-9.2	-19.3
D11	1	37.892146	-75.412361	-9.2	-19.3
D12	2	37.891324	-75.413019	-4.8	-19.3
D13	1	37.890857	-75.412812	-5.9	-19.3
D14	2	37.890287	-75.413370	-7.2	-19.3
D15	1	37.889611	-75.413444	-8.8	-19.3



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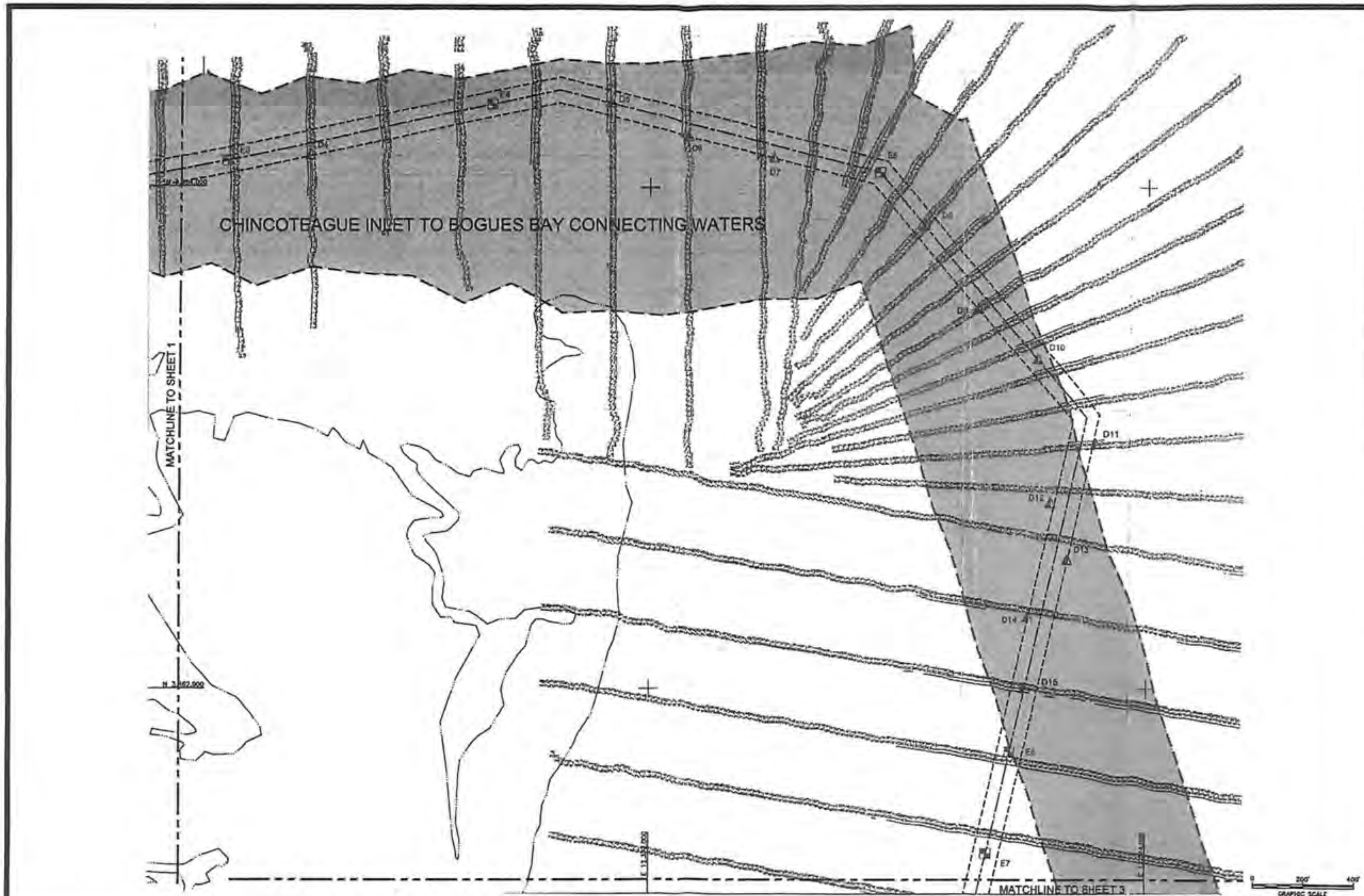
Boring Location Plan
Wallops Island M95 Intermodal Barge
Wallops Island, Virginia

Date: January 18, 2021
Scale: As Shown
Drawn: GBA Engineering
DWG. No. JDH-10/20/145-B-1



HYNES

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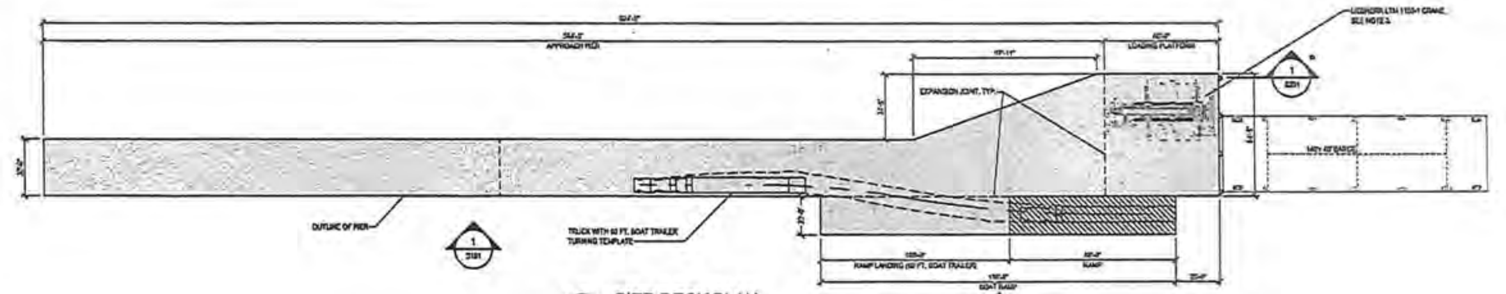
Boring Location Plan
Wallops Island M95 Intermodal Barge
Wallops Island, Virginia

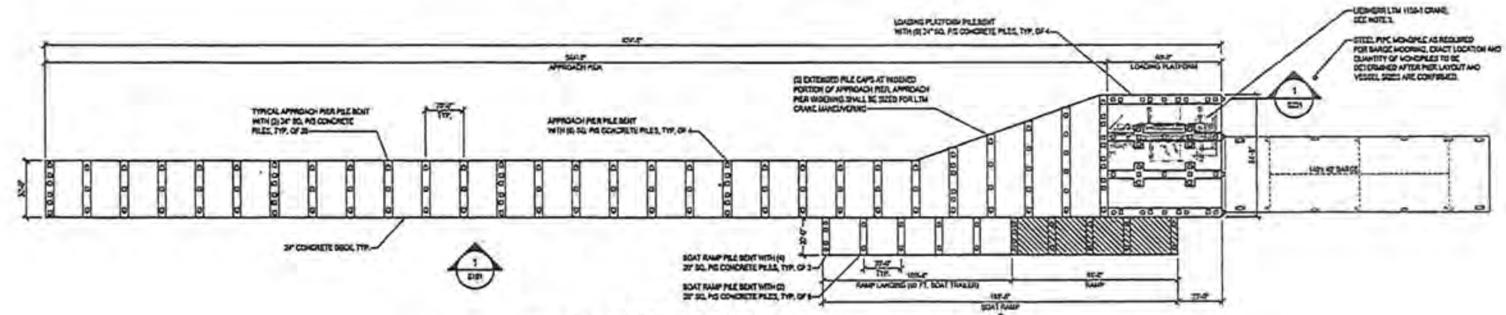
Date: January 18, 2021
Scale: As Shown
Drawn: GBA Engineering
DWG. No. JDH-10/20/145-B-2



A S101 **PIER DECK PLAN**

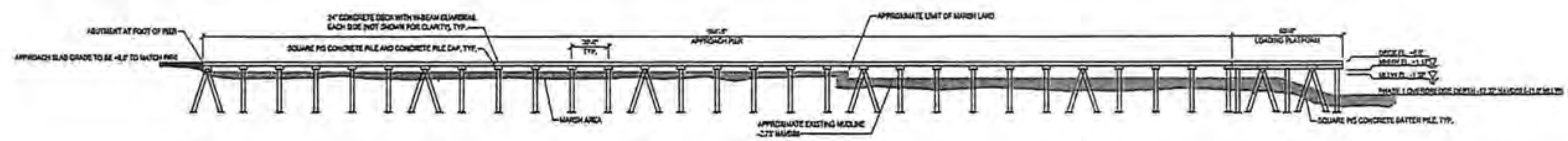
SCALE: 1/32" = 1'-0"

NOTES:
1. TRUCKS AND TRAILERS WILL BE REQUIRED TO TRAVEL DOWN THE PIER IN REVERSE.
2. THE RAMP LANDING SIZE IS CONTROLLED BY THE SIZE OF THE BOAT TRAILER. THE SIZE SHOWN IS FOR A [illegible] FT. BOAT TRAILER.
3. PIER OPERATIONS, INCLUDING LTM CRANE LOADING AND UNLOADING FROM THE BARGE AND USE OF THE BOAT RAMP CANNOT BE CARRIED OUT CONCURRENTLY.



B S101 **PIER FRAMING PLAN**

SCALE: 1/32" = 1'-0"



1 S101 **PIER ELEVATION**

SCALE: 1/32" = 1'-0"

NOTES:
1. BOAT RAMP NOT SHOWN FOR CLARITY. SEE ELEVATION 2/S201.
2. ALL ELEVATIONS REFER TO NAVD88 DATUM UNLESS NOTED OTHERWISE.

HYNES

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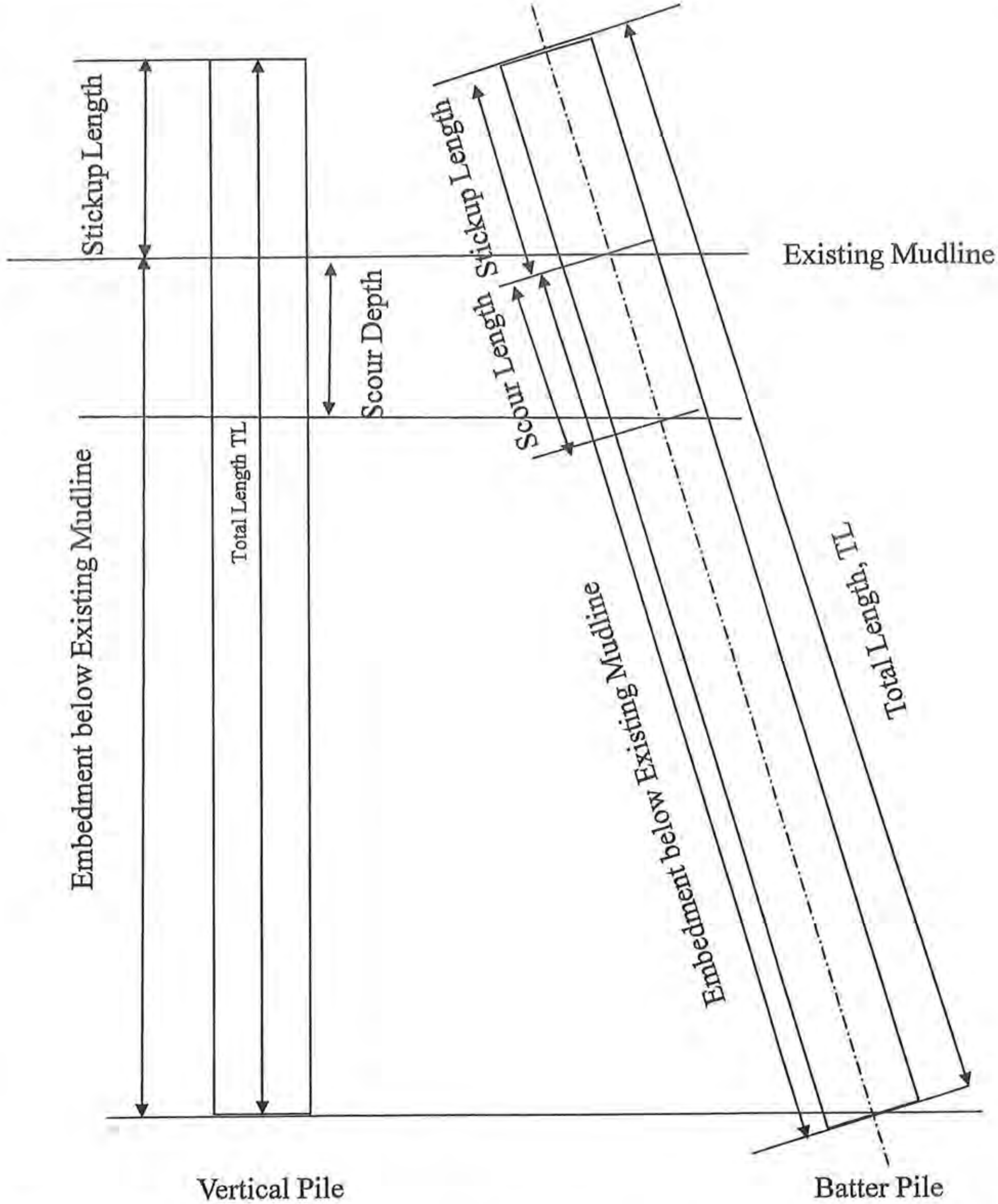
Proposed Pier Plan and Elevation
Wallops Island M95 Intermodal Barge
Wallops Island, Virginia

Date: March 10, 2021	
Scale: As Shown	
Drawn: GBA Engineering	
DWG. No. JDH-10/20/145-C	



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	Date: March 10, 2021
	Scale: N/A
	Drawn: DD
Pile Properties Wallops Island M95 Intermodal Barge Service Project Wallops Island, Virginia	**DWG. No.** **JDH-10/20/145-D**

HYNES & ASSOCIATES

LOG OF BORING L-1

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed:	: November 13, 2020
Logged By:	: J. Lindsey
Drilled By:	: B. Hynes
Drilling Method:	: HSA (Geoprobe 3230 DT)
Total Depth:	: 90.5 feet

Depth in Feet	Surf. Elev. 4.40
0	4.4
2	2.4
4	.4
6	-1.6
8	-3.6
10	-5.6
12	-7.6
14	-9.6
16	-11.6
18	-13.6
20	-15.6
22	-17.6
24	-19.6
26	-21.6
28	-23.6
30	-25.6
32	-27.6
34	-29.6
36	-31.6
38	-33.6
40	-35.6
42	-37.6
44	-39.6
46	-41.6
48	-43.6
50	

DESCRIPTION	USCS
Brown, wet, very loose, fine to medium SAND, with trace silt	SP
Dark brown, wet to saturated, very soft, clayey organic SILT, with trace fine sand	MH-OH
Gray, saturated, loose to very loose, fine to medium SAND, with trace silt	SP
Gray, saturated, very loose, fine to medium SAND, with some silt, trace to little clay	SM
Gray, saturated, very soft, clayey SILT, with trace fine sand, trace organic silt	CH
Gray, saturated, medium stiff to stiff, silty CLAY	CH
Brown, saturated, soft, clayey SILT, with trace fine sand	ML
Gray, saturated, very loose, fine to medium SAND, with little silt, trace clay, trace shell fragments	SM

Sample No.	Blows per 6 inches	Pocket Penetrometer Readings (tons/sq./ft.)
1	1-1-2-2	
2	1-2-1	0.0
3	1-1-2	
4	2-4-2	
5	1-1-1	
6	1-2-1	
7	1-2-2	
8	WOH/18"	
9	4-5-5	2.0
10	3-6-6	2.0
11	1-2-2	1.5
12	1-1-2	

REMARKS

Scale 1" ~ 7.4 feet

Approximately 6 inches of organic bearing soil was encountered at the ground surface.

Shelby Tube sample was pushed from 22 to 24 feet.

Groundwater was encountered at 3 feet during drilling operations.

Laboratory Test Results

Sample No. 3
From 6 to 7.5 feet

Natural Moisture = 36.3%

Sample No. 6
From 19 to 20.5 feet

Sieve Analysis

Sieve Size	Passing %
3/8"	100
No. 4	99.1
No. 10	98.5
No. 20	97.9
No. 40	97.4
No. 60	96.1
No. 100	63.8
No. 200	30.1
USCS:	SM

Natural Moisture = 25.1%

Sample No. 8
From 29 to 30.5 feet

Atterberg Limits

Liquid Limit = 57
Plasticity Index = 24
USCS: CH
Natural Moisture = 51.3%

NAD 83 VA State Plane South
Easting: 12365404
Northing: 3861122

HYNES & ASSOCIATES

LOG OF BORING L-1

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : November 13, 2020
Logged By: : J. Lindsey
Drilled By: : B. Hynes
Drilling Method: : HSA (Geoprobe 3230 DT)
Total Depth: : 90.5 feet

Depth in Feet	Surf. Elev. 4.40	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blows per 6 inches	Pocket Penetrometer Readings (tons/sq./ft.)	REMARKS
50	-45.6	Gray, saturated, very loose, fine to medium SAND, with little silt, trace clay, trace shell fragments		SM	12	1-1-2		The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
52	-47.6	Gray, saturated, medium stiff, clayey SILT, with little fine sand, trace shell fragments		ML				
54	-49.6				13	1-2-4		
56	-51.6							
58	-53.6							
60	-55.6				14	1-2-6		
62	-57.6	Gray, saturated, medium stiff to stiff, clayey SILT, with little fine sand, trace shell fragments		MH				
64	-59.6				15	1-2-4		
66	-61.6							
68	-63.6							
70	-65.6				16	2-4-4		
72	-67.6							
74	-69.6				17	2-4-7		
76	-71.6							
78	-73.6	Gray, saturated, medium dense, fine to medium SAND, with little silt, trace shell fragments		SM				
80	-75.6				18	6-9-12		
82	-77.6	Gray, saturated, dense, fine to medium SAND, with trace to little silt		SP-SM				
84	-79.6				19	8-18-23		
86	-81.6							
88	-83.6							
90	-85.6	Boring terminated at 90.5 feet.			20	9-16-24		
92	-87.6							
94	-89.6							
96	-91.6							
98	-93.6							
100								

HYNES & ASSOCIATES

LOG OF BORING P-1

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed:	: November 24, 2020
Logged By:	: A. Kus
Drilled By:	: M. Hynes
Drilling Method:	: HSA (Geoprobe 7822 DT)
Total Depth:	: 90.5 feet

Depth in Feet	Surf. Elev. -0.40	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blows per 6 inches
0	-.4	Gray, saturated, organic SILT, with trace fine to medium sand, trace clay		OL	1	HA
2	-2.4	Gray, saturated, medium dense, fine to medium SAND, with trace silt		SP	2	4-6-5
4	-4.4					
6	-6.4	Gray, saturated, medium dense, fine to medium SAND, with trace organic silt		SP	3	3-6-6
8	-8.4	Gray, saturated, loose, fine to medium SAND, with trace organic silt		SP	4	2-3-3
10	-10.4					
12	-12.4	Gray, saturated, very loose, fine to medium SAND, with little silt, trace organic silt		SM	5	1-2-1
14	-14.4					
16	-16.4	Gray, saturated, very soft, SILT, with little fine to medium sand, trace clay		ML	6	1-1-2
18	-18.4					
20	-20.4					
22	-22.4	Gray, saturated, medium dense, fine to medium SAND, with trace silt		SP	7	2-5-6
24	-24.4					
26	-26.4					
28	-28.4				8	3-5-8
30	-30.4					
32	-32.4	Gray, saturated, loose to medium dense, fine to medium SAND, with trace silt		SP	9	3-4-4
34	-34.4					
36	-36.4					
38	-38.4				10	3-5-7
40	-40.4					
42	-42.4				11	3-6-10
44	-44.4					
46	-46.4					
48	-48.4	Gray, saturated, medium dense to dense, fine to medium SAND, with little to trace silt		SM	12	17-19-20
50						

REMARKS

Scale 1" ~ 7.4 feet

No organic bearing soil was encountered at the ground surface.

Groundwater was not encountered during drilling operations.

Laboratory Test Results

Sample No. 2
From 3 to 4.5 feet

Natural Moisture = 25.6%

Sample No. 12
From 49 to 50.5 feet

Sieve Analysis

Sieve Size	Passing %
No. 10	100
No. 20	99.9
No. 40	99.5
No. 60	93.6
No. 100	42.2
No. 200	12.6
USCS:	SM

Natural Moisture = 23.7%

Sample No. 17
From 74 to 75.5 feet

Natural Moisture = 55.7%

NAD 83 VA State Plane South
Easting: 12365439
Northing: 3861379

The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.

HYNES & ASSOCIATES

LOG OF BORING P-1

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : November 24, 2020
Logged By: : A. Kus
Drilled By: : M. Hynes
Drilling Method: : HSA (Geoprobe 7822 DT)
Total Depth: : 90.5 feet

Depth in Feet	Surf. Elev. -0.40	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blows per 6 inches	REMARKS
50	-50.4	Gray, saturated, medium dense to dense, fine to medium SAND, with little to trace silt		SP-SM	12	17-19-20	
52	-52.4						
54	-54.4				13	6-8-11	
56	-56.4						
58	-58.4						
60	-60.4				14	5-6-8	
62	-62.4						
64	-64.4				15	15-17-19	
66	-66.4						
68	-68.4						
70	-70.4				16	12-18-24	
72	-72.4	Gray, saturated, very dense, fine to medium SAND, with little to trace silt		SP-SM			
74	-74.4				17	20-24-27	
76	-76.4						
78	-78.4	Gray, saturated, dense, fine to medium SAND, with little to trace silt		SP-SM			
80	-80.4				18	7-15-19	
82	-82.4						
84	-84.4				19	7-15-18	
86	-86.4						
88	-88.4						
90	-90.4				20	8-16-19	
92	-92.4	Boring terminated at 90.5 feet.					
94	-94.4						
96	-96.4						
98	-98.4						
100							

HYNES & ASSOCIATES

LOG OF BORING P-2

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 18, 2020
Logged By: : R. Rhoads
Drilled By: : M. Hynes
Drilling Method: : HSA/Rotary (Mobile B-47 HD)
Total Depth: : 90.5 feet

Depth in Feet	Surf. Elev. -2.80	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count
0	-2.8	Dark gray, saturated, medium dense, fine to medium SAND and SILT, with trace clay, trace organic silt		SM	1	1-6-6
3		Gray, saturated, medium dense, fine to medium SAND, with little silt		SM	2	6-9-10
7.5		Dark gray, saturated, medium dense, fine to medium SAND and SILT, with trace clay, trace organic silt		SM	3	3-4-8
					4	4-4-7
17.5		Dark gray, saturated, medium dense, fine to medium SAND and SILT, with trace clay		SM	5	9-7-8
					6	8-10-13
					7	5-8-11
32.5		Gray, saturated, medium dense, fine to medium SAND, with little silt, trace shell fragments		SM	8	12-13-15
					9	12-12-10
42.5		Dark gray, saturated, medium dense, fine to medium SAND and SILT, with trace clay		SM	10	2-5-7
47.5		Gray, saturated, stiff, silty CLAY, with trace fine sand, trace shell fragments		CL-ML	11	4-5-7

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50
Elevation scale: -2.8, -4.8, -6.8, -8.8, -10.8, -12.8, -14.8, -16.8, -18.8, -20.8, -22.8, -24.8, -26.8, -28.8, -30.8, -32.8, -34.8, -36.8, -38.8, -40.8, -42.8, -44.8, -46.8, -48.8, -50.8

REMARKS

Scale 1" ~ 7.4 feet

No organic bearing soil was encountered at the ground surface.

Water Depth: 3.7 ft.

Laboratory Test Results

Sample No. 11
From 49 to 50.5 feet

Atterberg Limits

Liquid Limit = 28
Plasticity Index = 7
USCS: CL-ML
Natural Moisture = 31.4%

NAD 83 VA State Plane South
Easting: 12365462
Northing: 3861627

The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.

HYNES & ASSOCIATES	# LOG OF BORING P-2

Gahagan & Bryant Associates, Inc. 9008 Yellow Brick Road, Unit O Baltimore, Maryland	Date Completed:	: December 18, 2020
	Logged By:	: R. Rhoads
	Drilled By:	: M. Hynes
Wallops Island M95 Intermodal Barge Service	Drilling Method:	: HSA/Rotary (Mobile B-47 HD)
Project No.: JDH-10/20/145	Total Depth:	: 90.5 feet

Depth in Feet	Surf. Elev. -2.80	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
50	-52.8	Gray, saturated, stiff, CLAY and SILT, with trace fine sand, trace shell fragments		CL-ML	11	4-5-7	
52	-54.8						
54	-56.8	Gray, saturated, very stiff, silty CLAY, with some to little fine sand, trace shell fragments		CL	12	4-8-9	
56	-58.8						
58	-60.8	Gray, saturated, stiff, silty CLAY, with little to trace fine sand		CL	13	4-6-8	
60	-62.8						
62	-64.8						
64	-66.8				14	6-7-8	
66	-68.8						
68	-70.8	Gray, saturated, very stiff, silty CLAY, with some fine to coarse sand, little shell fragments		CL	15	9-10-13	
70	-72.8						
72	-74.8	Gray, saturated, dense, fine to coarse SAND, with some silt, little shell fragments		SM	16	12-17-28	
74	-76.8						
76	-78.8						
78	-80.8	Gray, saturated, dense, fine to medium SAND, with some clay, some silt		SC	17	9-12-19	
80	-82.8						
82	-84.8	Gray, saturated, very dense, fine to coarse SAND, with some to little silt, trace clay, trace shell fragments		SM	18	20-50/5"	
84	-86.8						
86	-88.8						
88	-90.8	Gray, saturated, very dense, fine to coarse SAND, with some gravel, trace silt		SP	19	30-37-43	
90	-92.8	Boring terminated at 90.5 feet.					
92	-94.8						
94	-96.8						
96	-98.8						
98	-100.8						
100							

HYNES & ASSOCIATES

LOG OF BORING P-3

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 17, 2020
Logged By: : A. Kus
Drilled By: : M. Hynes
Drilling Method: : HSA/Rotary (Mobile B-47 HD)
Total Depth: : 90.5 feet

Depth in Feet	Surf. Elev. -2.70	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count
0	-2.7	Gray, saturated, loose, SILT, with little fine to medium sand, trace clay		ML	1	1-4-6
2	-4.7					
4	-6.7	Gray, saturated, medium dense, fine to medium SAND, with trace silt		SP	2	8-11-11
6	-8.7					
8	-10.7	Gray, saturated, loose, fine to medium SAND, with some to little silt, trace clay		SM	3	6-3-6
10	-12.7					
12	-14.7	Gray, saturated, medium dense, fine to medium SAND, with little to trace silt		SP-SM	4	3-7-7
14	-16.7					
16	-18.7					
18	-20.7					
20	-22.7				5	8-8-12
22	-24.7					
24	-26.7				6	9-13-18
26	-28.7					
28	-30.7	Gray, saturated, medium dense, fine to medium SAND, with little silt, trace clay		SM	7	10-10-11
30	-32.7					
32	-34.7	Gray, saturated, medium dense, fine to medium SAND, with little to trace silt		SP-SM	8	10-8-11
34	-36.7					
36	-38.7					
38	-40.7				9	9-14-11
40	-42.7					
42	-44.7	Gray, saturated, medium dense, fine to medium SAND, with some to little silt, trace clay		SM	10	7-12-15
44	-46.7					
46	-48.7					
48	-50.7	Gray, saturated, stiff, clayey SILT, with little fine to medium sand, trace shell fragments		ML	11	4-6-6
50						

REMARKS

Scale 1" ~ 7.4 feet

No organic bearing soil was encountered at the ground surface.

Water Depth: 4.5 ft. at 12:00 pm

Laboratory Test Results

Sample No. 2
From 4 to 5.5 feet

Sieve Analysis

Sieve Size	Passing %
No. 20	100
No. 40	99.5
No. 60	85.6
No. 100	86.1
No. 200	5.5
USCS:	SP

Natural Moisture = 23.1%

Sample No. 8
From 34 to 35.5 feet

Natural Moisture = 23.5%

Sample No. 12
From 54 to 55.5 feet

Atterberg Limits

Liquid Limit = 33
Plasticity Index = 20
USCS: CL
Natural Moisture = 25.5%

Sample No. 16
From 74 to 75.5 feet

Atterberg Limits

Liquid Limit = 60
Plasticity Index = 28
USCS: CH
Natural Moisture = 39.1%

NAD 83 VA State Plane South
Easting: 12365490
Northing: 3861891

HYNES & ASSOCIATES

LOG OF BORING P-3

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 17, 2020
Logged By: : A. Kus
Drilled By: : M. Hynes
Drilling Method: : HSA/Rotary (Mobile B-47 HD)
Total Depth: : 90.5 feet

Depth in Feet	Surf. Elev. -2.70	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
50	-52.7	Gray, saturated, stiff, clayey SILT, with little fine to medium sand, trace shell fragments		ML	11	4-6-6	The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
52	-54.7	Gray, saturated, very stiff, silty CLAY, with little fine to medium sand, little shell fragments		CL			
54	-56.7				12	6-8-10	
56	-58.7						
58	-60.7						
60	-62.7				13	8-8-10	
62	-64.7	Gray, saturated, very stiff, clayey SILT, with little fine to medium sand, trace shell fragments		ML			
64	-66.7				14	7-8-11	
66	-68.7						
68	-70.7	Gray, saturated, very stiff, silty CLAY, with little fine to medium sand, trace shell fragments		CL			
70	-72.7				15	10-11-10	
72	-74.7	Gray, saturated, very stiff, clayey SILT, with trace fine to medium sand		CH			
74	-76.7				16	8-12-14	
76	-78.7						
78	-80.7	Gray, saturated, very stiff, clayey SILT, with little fine to coarse sand, trace shell fragments		ML/MH			
80	-82.7				17	9-13-14	
82	-84.7	Gray, saturated, dense, fine to medium SAND, with little silt, trace clay		SM			
84	-86.7				18	14-24-30	
86	-88.7						
88	-90.7	Gray, saturated, very dense, fine to coarse SAND, with trace silt		SP			
90	-92.7				19	20-29-39	
92	-94.7	Boring terminated at 90.5 feet.					
94	-96.7						
96	-98.7						
98	-100.7						
100							

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HYNES HYNES & ASSOCIATES

LOG OF BORING P-4

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed:	: December 23, 2020
Logged By:	: D. Csanda
Drilled By:	: B. Hynes
Drilling Method:	: HSA/Rotary (Mobile B-47 HD)
Total Depth:	: 120.5 feet

Depth in Feet	Surf. Elev. -2.70
0	-2.7
2	-4.7
4	-6.7
6	-8.7
8	-10.7
10	-12.7
12	-14.7
14	-16.7
16	-18.7
18	-20.7
20	-22.7
22	-24.7
24	-26.7
26	-28.7
28	-30.7
30	-32.7
32	-34.7
34	-36.7
36	-38.7
38	-40.7
40	-42.7
42	-44.7
44	-46.7
46	-48.7
48	-50.7
50	

DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count
Gray, saturated, loose, fine to medium SAND, with trace silt		SP	1	1-4-6
Gray, saturated, medium dense, fine to medium SAND, with trace silt		SP	2	8-8-10
Gray, saturated, very loose, fine to medium SAND, with little silt		SM	3	1-1-2
Gray, saturated, medium dense, fine to medium SAND, with little silt		SM	4	3-8-8
			5	12-12-17
Gray, saturated, medium dense, fine to medium SAND, with little silt, trace shell fragments		SM	6	17-17-10
Gray to brown, saturated, very stiff, silty CLAY		CL	7	5-8-11
Gray, saturated, very stiff, silty CLAY, with trace fine to medium sand		CL	8	7-10-13
Gray, saturated, soft, silty CLAY, with trace fine to medium sand, trace shell fragments		CL	9	3-2-2
Gray, saturated, very stiff, silty CLAY, with trace fine to meidum sand, trace shell fragments		CL	10	3-7-10
Gray, saturated, hard to stiff, silty CLAY, with some fine to medium sand, trace shell fragments		CL	11	7-14-18

REMARKS

Scale 1" ~ 7.4 feet

No organic bearing soil was encountered at the ground surface.

Water Depth: 2 ft. 3 in. at 8:30 am

Shelby Tube sample was pushed from 32 to 34 feet with no recovery.

Laboratory Test Results

Sample No. 11
From 49 to 50.5 feet

Atterberg Limits

Liquid Limit = 33
Plasticity Index = 14
USCS: CL
Natural Moisture = 25.7%

Sample No. 23
From 109 to 110.5 feet

Atterberg Limits

Liquid Limit = 49
Plasticity Index = 17
USCS: ML
Natural Moisture = 34.9%

NAD 83 VA State Plane South
Easting: 12365519
Northing: 3862142

The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.

HYNES & ASSOCIATES

LOG OF BORING P-4

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 23, 2020
Logged By: : D. Csanda
Drilled By: : B. Hynes
Drilling Method: : HSA/Rotary (Mobile B-47 HD)
Total Depth: : 120.5 feet

Depth in Feet	Surf. Elev. -2.70	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
50	-52.7	Gray, saturated, hard to stiff, silty CLAY, with some fine to medium sand, trace shell fragments			11	7-14-18	
52	-54.7						
54	-56.7				12	14-18-20	
56	-58.7			CL			
58	-60.7						
60	-62.7				13	12-6-6	
62	-64.7	Gray, saturated, stiff, silty CLAY, with trace shell fragments					
64	-66.7				14	4-6-8	
66	-68.7			CL			
68	-70.7						
70	-72.7				15	5-6-7	
72	-74.7	Gray, saturated, hard, silty CLAY, with trace fine to medium sand					
74	-76.7			CL	16	17-21-33	
76	-78.7						
78	-80.7	Gray, saturated, very stiff to hard, silty CLAY, with some fine to medium sand, little shell fragments					
80	-82.7				17	10-17-25	
82	-84.7						
84	-86.7				18	10-13-18	
86	-88.7			CL			
88	-90.7						
90	-92.7				19	10-14-15	
92	-94.7						
94	-96.7				20	17-24-34	
96	-98.7						
98	-100.7	Gray, saturated, hard, silty CLAY, with trace fine to medium sand		CL			
100					21	14-16-21	

LOG OF BORING P-4

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed:	: December 23, 2020
Logged By:	: D. Csanda
Drilled By:	: B. Hynes
Drilling Method:	: HSA/Rotary (Mobile B-47 HD)
Total Depth:	: 120.5 feet

Depth in Feet	Surf. Elev. -2.70	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
100	-102.7	Gray, saturated, hard, silty CLAY, with trace fine to medium sand		CL	21	14-16-21	
102	-104.7						
104	-106.7				22	10-21-30	
106	-108.7						
108	-110.7	Gray, saturated, hard, clayey SILT, with trace fine to medium sand		ML			
110	-112.7				23	22-40-50/4"	
112	-114.7	Gray, saturated, hard, silty CLAY, with trace fine to medium sand		CL			
114	-116.7				24	18-32-48	
116	-118.7						
118	-120.7						
120	-122.7				25	20-41-50/5"	
122	-124.7	Boring terminated at 120.5 feet.					
124	-126.7						
126	-128.7						
128	-130.7						
130	-132.7						
132	-134.7						
134	-136.7						
136	-138.7						
138	-140.7						
140	-142.7						
142	-144.7						
144	-146.7						
146	-148.7						
148	-150.7						
150							

HYNES & ASSOCIATES

LOG OF BORING P-5

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 21, 2020
Logged By: : D. Csanda
Drilled By: : B. Hynes
Drilling Method: : HSA/Rotary (Mobile B-47 HD)
Total Depth: : 110.5 feet

Depth in Feet	Surf. Elev. -10.50	DESCRIPTION	USCS	Sample	Blow Count
0	-10.5	Gray, saturated, very loose, fine to medium SAND and SILT, with trace organic silt	SM	1	1-2-2
2	-12.5	Gray, saturated, medium dense, fine to medium SAND, with trace silt, trace organic silt	SP	2	7-7-10
				3	8-9-9
				4	7-8-8
12	-22.5	Gray, saturated, medium dense, fine to medium SAND, with trace shell fragments	SP	5	10-8-10
17		Gray, saturated, very soft, clayey SILT, with trace fine to medium sand	ML	6	1-2-2
22	-32.5	Gray to brown, saturated, stiff, silty CLAY, with trace fine to medium sand	CL-CH	7	1-4-8
				8	3-6-8
32	-42.5	Brown, saturated, stiff, silty CLAY, with trace fine to medium sand	CL	9	5-6-9
37		Gray, saturated, very stiff, silty CLAY, with trace fine to medium sand, trace shell fragments	CL	10	2-3-4
42	-52.5	Gray, saturated, stiff to very stiff, silty CLAY, with some fine to medium sand, trace shell fragments	CL	11	4-4-10
				12	4-10-11

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50
Elevation scale: -10.5, -12.5, -14.5, -16.5, -18.5, -20.5, -22.5, -24.5, -26.5, -28.5, -30.5, -32.5, -34.5, -36.5, -38.5, -40.5, -42.5, -44.5, -46.5, -48.5, -50.5, -52.5, -54.5, -56.5, -58.5

REMARKS

Scale 1" ~ 7.4 feet

No organic bearing soil was encountered at the ground surface.

Water Depth: 12 ft. at 10:30 am

Shelby Tube sample was pushed from 42 to 44 feet.

Laboratory Test Results

Sample No. 3
From 6 to 7.5 feet

Natural Moisture = 27.6%

Sample No. 2
From 4 to 5.5 feet

Sieve Analysis

Sieve Size	Passing %
No. 20	100
No. 40	99.7
No. 60	83.3
No. 100	32.9
No. 200	4.8
USCS:	SP

Natural Moisture = 25.3%

Sample No. 8
From 29 to 30.5 feet

Atterberg Limits

Liquid Limit = 50
Plasticity Index = 27
USCS: CL-CH
Natural Moisture = 32.1%

Sample No. 14
From 59 to 60.5 feet

Atterberg Limits

Liquid Limit = 67
Plasticity Index = 40
USCS: CH
Natural Moisture = 43.2%

HYNES & ASSOCIATES

LOG OF BORING P-5

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 21, 2020
Logged By: : D. Csanda
Drilled By: : B. Hynes
Drilling Method: : HSA/Rotary (Mobile B-47 HD)
Total Depth: : 110.5 feet

Depth in Feet	Surf. Elev. -10.50	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count
50	-60.5	Gray, saturated, stiff to very stiff, silty CLAY, with some fine to medium sand, trace shell fragments		CL	12	4-10-11
52	-62.5					
54	-64.5	Gray, saturated, very stiff, silty CLAY, with trace shell fragments		CL	13	5-10-12
56	-66.5					
58	-68.5	Gray, saturated, very stiff, silty CLAY				
60	-70.5			CH	14	6-8-11
62	-72.5					
64	-74.5	Gray, saturated, very stiff, silty CLAY, with some fine to medium sand, trace shell fragments		CL	15	8-8-10
66	-76.5					
68	-78.5	Gray, saturated, dense, fine to medium SAND and SILT, with trace clay, trace shell fragments				
70	-80.5				16	11-13-20
72	-82.5			SM		
74	-84.5				17	13-14-19
76	-86.5					
78	-88.5	Gray, saturated, medium dense, fine to medium SAND, with some silt, trace shell fragments		SM		
80	-90.5				18	6-11-18
82	-92.5	Gray, saturated, hard, silty CLAY				
84	-94.5				19	9-13-21
86	-96.5					
88	-98.5			CL		
90	-100.5				20	16-21-30
92	-102.5					
94	-104.5	Gray, saturated, hard, silty CLAY, with trace fine to medium sand		CL	21	17-24-38
96	-106.5					
98	-108.5	Gray, saturated, hard, silty CLAY		CL		
100					22	18-31-43

REMARKS

Sample No. 23
From 104 to 105.5 feet

Natural Moisture = 39.2%

NAD 83 VA State Plane South
Easting: 12365548
Northing: 3862392

The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.

HYNES & ASSOCIATES	LOG OF BORING P-5 (Page 3 of 3)
Gahagan & Bryant Associates, Inc. 9008 Yellow Brick Road, Unit O Baltimore, Maryland	Date Completed: : December 21, 2020 Logged By: : D. Csanda Drilled By: : B. Hynes Drilling Method: : HSA/Rotary (Mobile B-47 HD) Total Depth: : 110.5 feet
Wallops Island M95 Intermodal Barge Service Project No.: JDH-10/20/145	

Depth in Feet	Surf. Elev. -10.50	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
100	-110.5	Gray, saturated, hard, silty CLAY		CL	22	18-31-43	
102	-112.5						
104	-114.5				23	19-36-47	
106	-116.5						
108	-118.5						
110	-120.5				24	20-34-47	
		Boring terminated at 110.5 feet.					
112	-122.5						
114	-124.5						
116	-126.5						
118	-128.5						
120	-130.5						
122	-132.5						
124	-134.5						
126	-136.5						
128	-138.5						
130	-140.5						
132	-142.5						
134	-144.5						
136	-146.5						
138	-148.5						
140	-150.5						
142	-152.5						
144	-154.5						
146	-156.5						
148	-158.5						
150							

HYNES & ASSOCIATES

LOG OF BORING D-2

(Page 1 of 1)

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 28, 2020
Logged By: : D. Csanda
Drilled By: : M. Hynes
Drilling Method: : HSA (Mobile B-47 HD)
Total Depth: : 14 feet

Depth in Feet	Surf. Elev. -10.30	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-10.3	Gray, saturated, medium dense, fine to medium SAND, with trace silt, trace clay		SP	1	7-6-6-7	Scale 1" ~ 3 feet No organic bearing soil was encountered at the ground surface. Water Depth: 13.0 ft. Laboratory Test Results Sample No. 5 From 8 to 10 feet Hydrometer Analysis (See Graph) USCS: SP Natural Moisture = 20.0% NAD 83 VA State Plane South Easting: 12366943 Northing: 3863058 The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
2	-12.3				2	7-7-7-8	
4	-14.3	Gray, saturated, loose, fine to medium SAND, with little to trace silt		SP-SM	3	11-4-4-5	
6	-16.3				4	6-4-4-3	
8	-18.3	Gray, saturated, loose, fine to medium SAND, with trace silt, trace clay		SP	5	8-2-4-5	
10	-20.3	Gray, saturated, medium dense, fine to medium SAND, with little to trace silt		SP-SM	6	5-6-6-8	
12	-22.3	Gray, saturated, medium dense, fine to medium SAND, with trace silt, trace shells		SP	7	12-6-5-8	
14	-24.3	Boring terminated at 14 feet.					
16	-26.3						
18	-28.3						
20							

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LOG OF BORING D-4

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed:	: December 28, 2020
Logged By:	: D. Csanda
Drilled By:	: M. Hynes
Drilling Method:	: HSA (Mobile B-47 HD)
Total Depth:	: 10 feet

Depth in Feet	Surf. Elev. -11.40	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count
0	-11.4	Gray, saturated, very loose, fine to medium SAND, with trace shells		SP	1	4-2-2-3
2	-13.4	Gray, saturated, medium dense, fine to medium SAND, with trace shells		SP	2	7-3-7-5
4	-15.4				3	6-6-7-7
6	-17.4	Gray, saturated, very loose, fine to medium SAND, with little to trace silt, trace clay		SP-SM	4	1-1-2-3
8	-19.4	Gray, saturated, soft, SILT, with some fine to medium sand, little clay		ML	5	1-1-2-3
10	-21.4	Boring terminated at 10 feet.				
12	-23.4					
14	-25.4					
16	-27.4					
18	-29.4					
20						

REMARKS

Scale 1" ~ 3 feet

No organic bearing soil was encountered at the ground surface.

Water Depth: 11.5 ft.

Laboratory Test Results

Sample No. 5
From 8 to 10 feet

Hydrometer Analysis (See Graph)
USCS: ML
Natural Moisture = 31.0%

NAD 83 VA State Plane South
Easting: 12370656
Northing: 3864121

The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.

HYNES & ASSOCIATES

LOG OF BORING D-6

(Page 1 of 1)

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 31, 2020
Logged By: : D. Csanda
Drilled By: : M. Hynes
Drilling Method: : HSA (Mobile B-47 HD)
Total Depth: : 10 feet

Depth in Feet	Surf. Elev. -10.10	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-10.1	Gray, saturated, medium dense, fine to medium SAND, with trace silt		SP	1	24-9-8-8	Scale 1" ~ 3 feet No organic bearing soil was encountered at the ground surface. Water Depth: 16.0 ft. Laboratory Test Results Sample No. 1 From 0 to 2 feet Hydrometer Analysis (See Graph) USCS: SP Natural Moisture = 24.9% Sample No. 3 From 4 to 6 feet Hydrometer Analysis (See Graph) USCS: SP Natural Moisture = 17.0% NAD 83 VA State Plane South Easting: 12372163 Northing: 3864201 The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
2	-12.1				2	18-20-27-15	
4	-14.1	Gray, saturated, dense, fine to medium SAND, with trace silt, trace shells		SP	3	16-15-18-18	
6	-16.1				4	12-14-19-20	
8	-18.1				5	17-15-22-24	
10	-20.1	Boring terminated at 10 feet.					
12	-22.1						
14	-24.1						
16	-26.1						
18	-28.1						
20							

HYNES & ASSOCIATES

LOG OF BORING D-9

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : January 5, 2021
Logged By: : D. Csanda
Drilled By: : M. Hynes
Drilling Method: : HSA (Mobile B-47 HD)
Total Depth: : 18 feet

Depth in Feet	Surf. Elev. -3.10	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count
0	-3.1	Brown, saturated, loose, fine to medium SAND, with trace shells, trace silt		SP	1	13-5-5-4
2	-5.1				2	15-6-5-5
4	-7.1	Brown to gray, saturated, loose to medium dense, fine to medium SAND, with trace silt, trace shells		SP	3	8-2-5-4
6	-9.1				4	6-7-5-5
8	-11.1				5	7-4-5-7
10	-13.1				6	15-5-6-7
12	-15.1	Gray, saturated, dense, fine to medium SAND, with trace silt		SP	7	17-17-19-20
14	-17.1	Gray, saturated, dense, fine to medium SAND, with trace silt, trace shells		SP	8	20-16-19-21
16	-19.1				9	15-17-20-22
18	-21.1	Boring terminated at 18 feet.				
20						

REMARKS

Scale 1" ~ 3 feet

No organic bearing soil was encountered at the ground surface.

Water Depth: 4.3 ft.

Laboratory Test Results

Sample No. 7
From 12 to 14 feet

Hydrometer Analysis (See Graph)
USCS: SP
Natural Moisture = 17.9%

NAD 83 VA State Plane South
Easting: 12373304
Northing: 3863541

The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.

HYNES & ASSOCIATES

LOG OF BORING D-11

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : January 5, 2021
Logged By: : D. Csanda
Drilled By: : M. Hynes
Drilling Method: : HSA (Mobile B-47 HD)
Total Depth: : 10 feet

Depth in Feet	Surf. Elev. -10.90	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-10.9	Brown, saturated, medium dense, fine to medium SAND, with trace silt		SP	1	12-11-6-7	Scale 1" ~ 3 feet No organic bearing soil was encountered at the ground surface.
2	-12.9	Brown, saturated, medium dense, fine to medium SAND, with trace silt, trace shells		SP	2	8-11-12-11	Water Depth: 15.7 ft. Laboratory Test Results
4	-14.9	Brown, satuarated, medium dense, fine to medium SAND, with trace silt		SP	3	6-7-7-4	Sample No. 5 From 8 to 10 feet Hydrometer Analysis (See Graph) USCS: SP Natural Moisture = 23.1%
6	-16.9				4	8-9-11-13	NAD 83 VA State Plane South Easting: 12373834 Northing: 3863013
8	-18.9	Gray, saturated, loose, fine to medium SAND, with trace silt		SP	5	4-3-4-6	The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
10	-20.9	Boring terminated at 10 feet.					
12	-22.9						
14	-24.9						
16	-26.9						
18	-28.9						
20							

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LOG OF BORING D-13

(Page 1 of 1)

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed:	: January 4, 2021
Logged By:	: D. Csanda
Drilled By:	: M. Hynes
Drilling Method:	: HSA (Mobile B-47 HD)
Total Depth:	: 4 feet

Depth in Feet	Surf. Elev. -7.70	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-7.7	Brown, saturated, loose, fine to medium SAND, with trace silt		SP	1	5-4-4-4	Scale 1" ~ 3 feet No organic bearing soil was encountered at the ground surface.
2	-9.7	Brown, saturated, medium dense, fine to medium SAND, with trace silt, trace shells		SP	2	15-9-9-10	Water Depth: 10.0 ft. NAD 83 VA State Plane South Easting: 12373678 Northing: 3862510
4	-11.7	Boring terminated at 4 feet.					The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
6	-13.7						
8	-15.7						
10	-17.7						
12	-19.7						
14	-21.7						
16	-23.7						
18	-25.7						
20							

HYNES & ASSOCIATES

LOG OF BORING D-15

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed:	: January 4, 2021
Logged By:	: D. Csanda
Drilled By:	: M. Hynes
Drilling Method:	: HSA (Mobile B-47 HD)
Total Depth:	: 10 feet

Depth in Feet	Surf. Elev. -10.40	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count
0	-10.4	Brown, saturated, medium dense, fine to medium SAND, with trace silt		SP	1	2-5-5-6
2	-12.4	Gray, saturated, medium dense, fine to medium SAND, with trace silt		SP	2	6-4-4-7
4	-14.4	Brown to gray, satuarated, dense, fine to medium SAND, with trace silt, trace shells		SP	3	9-11-17-20
6	-16.4	Brown to gray, saturated, medium dense, fine to medium SAND, with trace silt, trace shells		SP	4	7-8-13-14
8	-18.4				5	9-10-14-15
10	-20.4	Boring terminated at 10 feet.				
12	-22.4					
14	-24.4					
16	-26.4					
18	-28.4					
20						

REMARKS

Scale 1" ~ 3 feet

No organic bearing soil was encountered at the ground surface.

Water Depth: 10.0 ft.

Laboratory Test Results

Sample No. 5
From 8 to 10 feet

Hydrometer Analysis (See Graph)
USCS: SP
Natural Moisture = 17.0%

NAD 83 VA State Plane South
Easting: 12373512
Northing: 3862000

The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.

HYNES & ASSOCIATES

LOG OF BORING E-2

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 28, 2020
Logged By: : D. Csanda
Drilled By: : M. Hynes
Drilling Method: : HSA (Mobile B-47 HD)
Total Depth: : 8 feet

Depth in Feet	Surf. Elev. -17.50	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-17.5	Gray, saturated, medium dense, fine to medium SAND, with trace shells		SP	1	8-7-6-5	Scale 1" ~ 3 feet No organic bearing soil was encountered at the ground surface.
2	-19.5	Gray, saturated, medium dense, fine to medium SAND, with trace shells			2	10-5-5-8	Water Depth: 16.0 ft. Laboratory Test Results Sample No. 2 From 2 to 4 feet
4	-21.5			SP	3	19-5-7-7	Hydrometer Analysis (See Graph) USCS: SP Natural Moisture = 22.4%
6	-23.5				4	11-6-6-8	NAD 83 VA State Plane South Easting: 12368034 Northing: 3863493
8	-25.5	Boring terminated at 8 feet.					The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
10	-27.5						
12	-29.5						
14	-31.5						
16	-33.5						
18	-35.5						
20							

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HYNES & ASSOCIATES

LOG OF BORING E-4

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed:	: December 28, 2020
Logged By:	: D. Csanda
Drilled By:	: M. Hynes
Drilling Method:	: HSA (Mobile B-47 HD)
Total Depth:	: 8 feet

Depth in Feet	Surf. Elev. -12.00	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-12	Brown, saturated, loose, fine to medium SAND, with little to trace silt, trace clay		SP	1	4-3-3-3	Scale 1" ~ 3 feet No organic bearing soil was encountered at the ground surface.
2	-14	Gray, saturated, loose to medium dense, fine to medium SAND, with trace shells		SP	2	5-5-4-5	Water Depth: 11.0 ft. Laboratory Test Results
4	-16				3	6-8-3-5	Sample No. 4 From 6 to 8 feet Hydrometer Analysis (See Graph) USCS: SP Natural Moisture = 18.4%
6	-18				4	6-6-10-11	NAD 83 VA State Plane South Easting: 12371382 Northing: 3864328
8	-20	Boring terminated at 8 feet.					The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
10	-22						
12	-24						
14	-26						
16	-28						
18	-30						
20							

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HYNES & ASSOCIATES

LOG OF BORING E-7

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : January 4, 2021
Logged By: : D. Csanda
Drilled By: : M. Hynes
Drilling Method: : HSA (Mobile B-47 HD)
Total Depth: : 6 feet

Depth in Feet	Surf. Elev. -16.00	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-16	Brown, saturated, medium dense, fine to medium SAND, with trace silt		SP	1	3-4-5-6	Scale 1" ~ 3 feet No organic bearing soil was encountered at the ground surface. Water Depth: 13.0 ft.
2	-18				2	7-5-6-8	Laboratory Test Results Sample No. 2 From 2 to 4 feet
4	-20	Brown to gray, satuarated, dense, fine to medium SAND, with trace silt, trace shells		SP	3	11-14-17-19	Hydrometer Analysis (See Graph) USCS: SP Natural Moisture = 23.1%
6	-22	Boring terminated at 6 feet.					NAD 83 VA State Plane South Easting: 12373364 Northing: 3861342
8	-24						The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
10	-26						
12	-28						
14	-30						
16	-32						
18	-34						
20							

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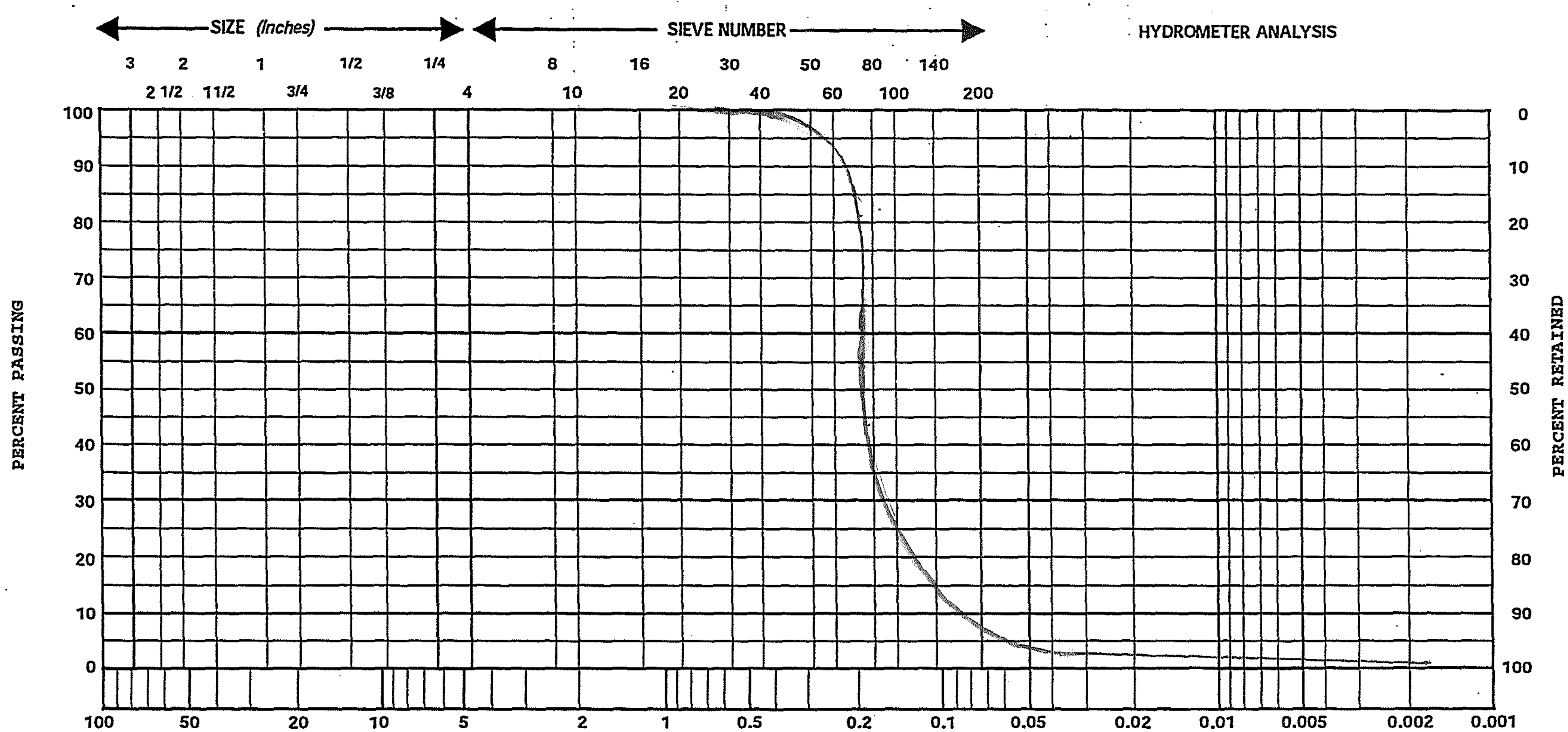
GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT	2. DATE
Wallops Island M95 Intermodal Barge Service	1/25/21

SIEVE ANALYSIS - US STANDARD SIEVE SIZES



GRAIN SIZE IN MILLIMETERS

EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc $(D_{30})^2/(D_{60} \times D_{10})$	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
E2	S2	NP	NP	NP				SP

3. TECHNICIAN (Signature)	4. PLOTTED BY (Signature)	5. CHECKED BY (Signature)
Joe Long		

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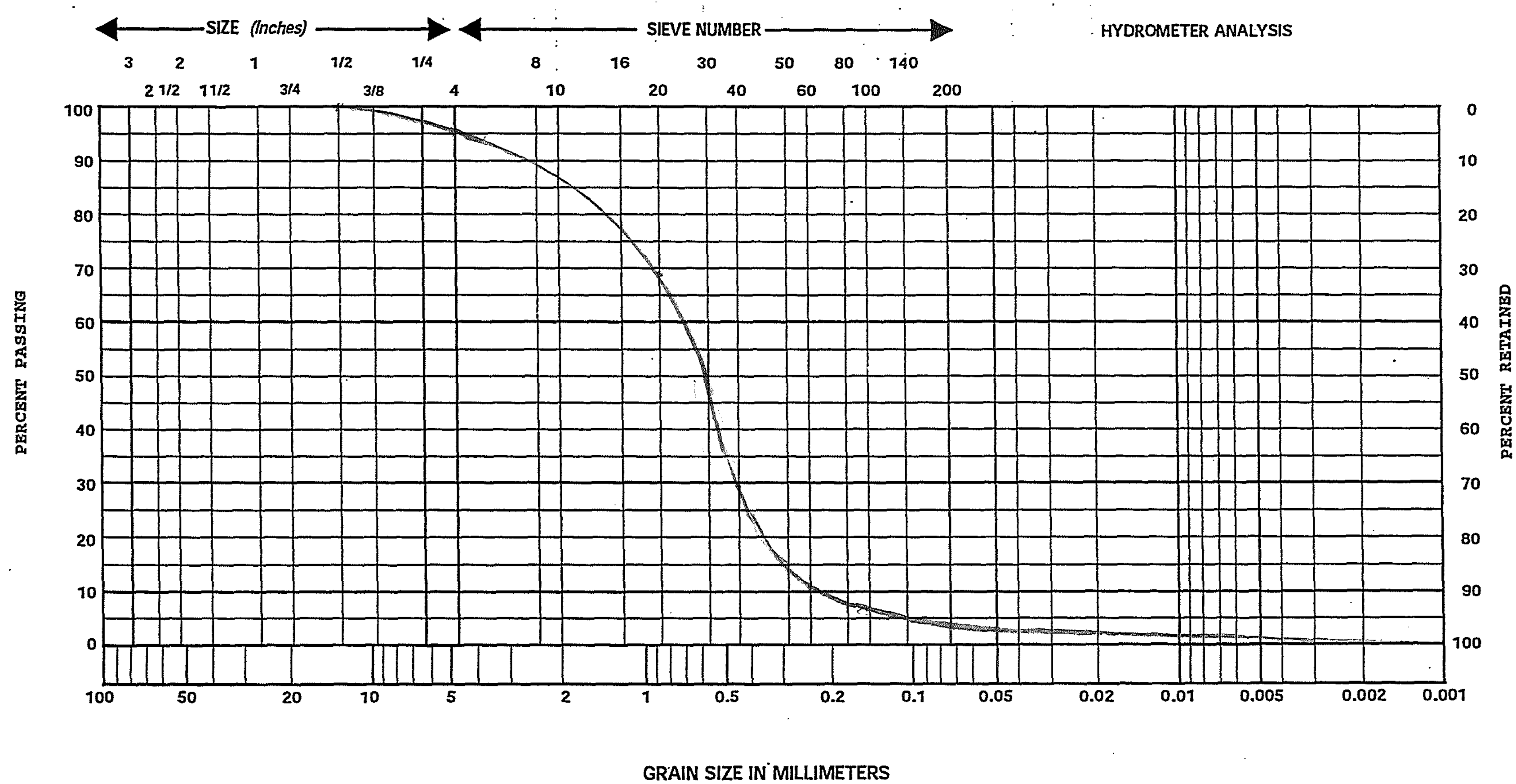
GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT Wallops Island M95 Intermodal Barge Service	2. DATE 1/25/21

SIEVE ANALYSIS - US STANDARD SIEVE SIZES



EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc $(D_{30})^2/(D_{60} \times D_{10})$	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
E4	S4	NP	NP	NP				SP

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Joe Long		

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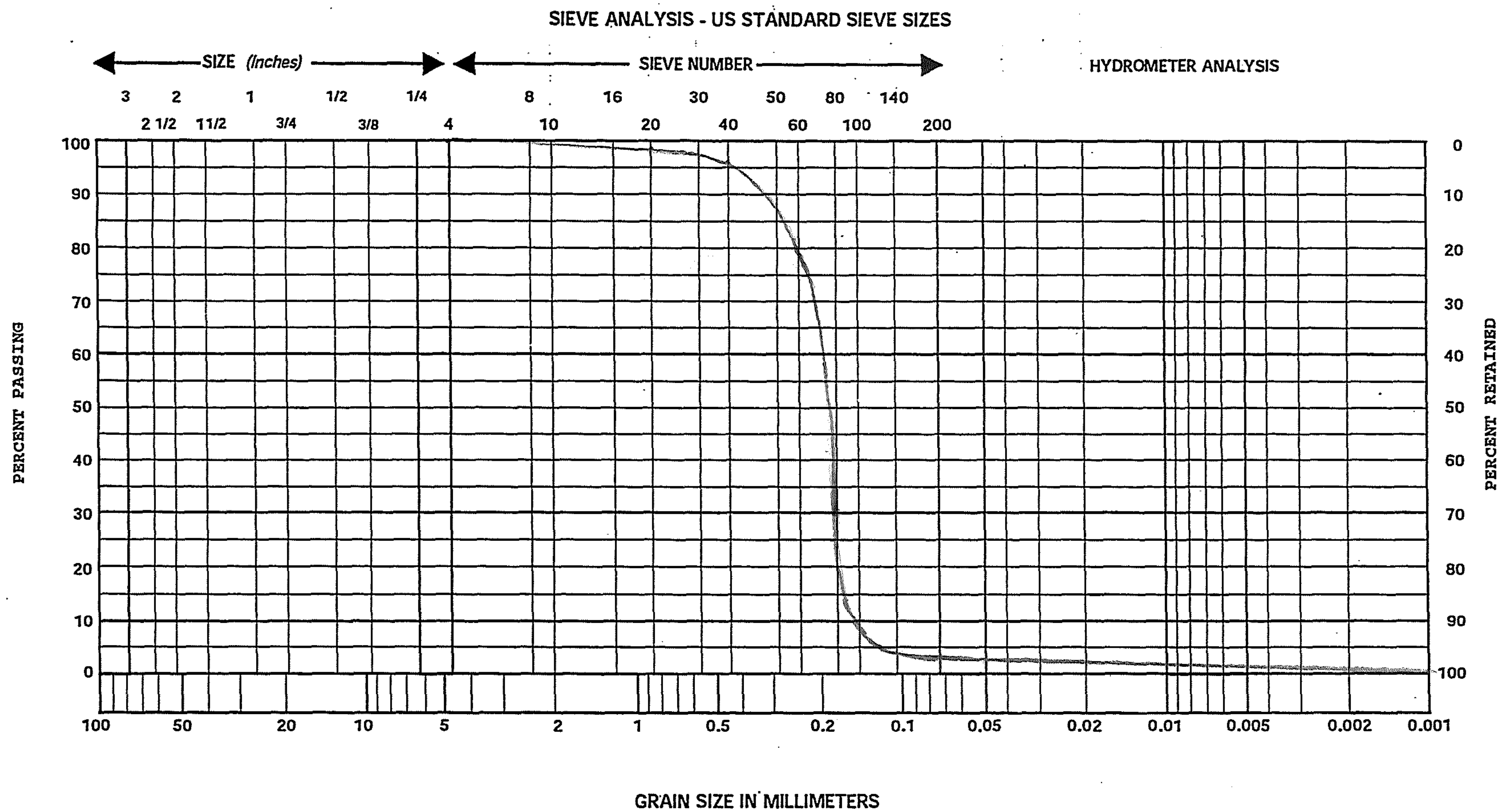
GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT Wallops Island M95 Intermodal Barge Service

2. DATE 1/25/21



EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc $(D_{30})^2/(D_{60} \times D_{10})$	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
E7	S2	NP	NP	NP				SP

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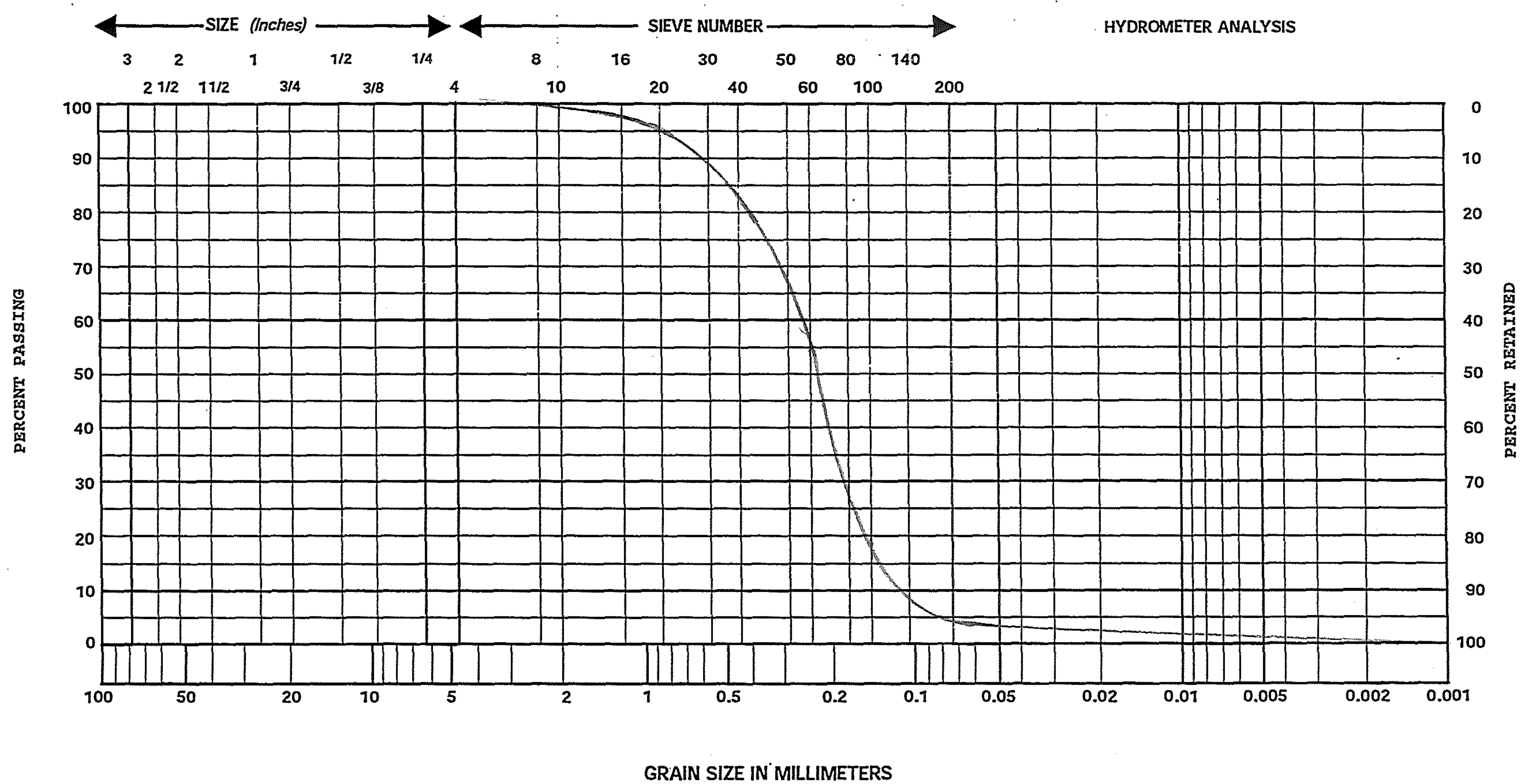
GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT	2. DATE
Wallops Island Intermodal Barge Service	1/25/21

SIEVE ANALYSIS - US STANDARD SIEVE SIZES



EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc $(D_{30})^2/(D_{60} \times D_{10})$	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
D2	S5	NP	NP	NP				SP

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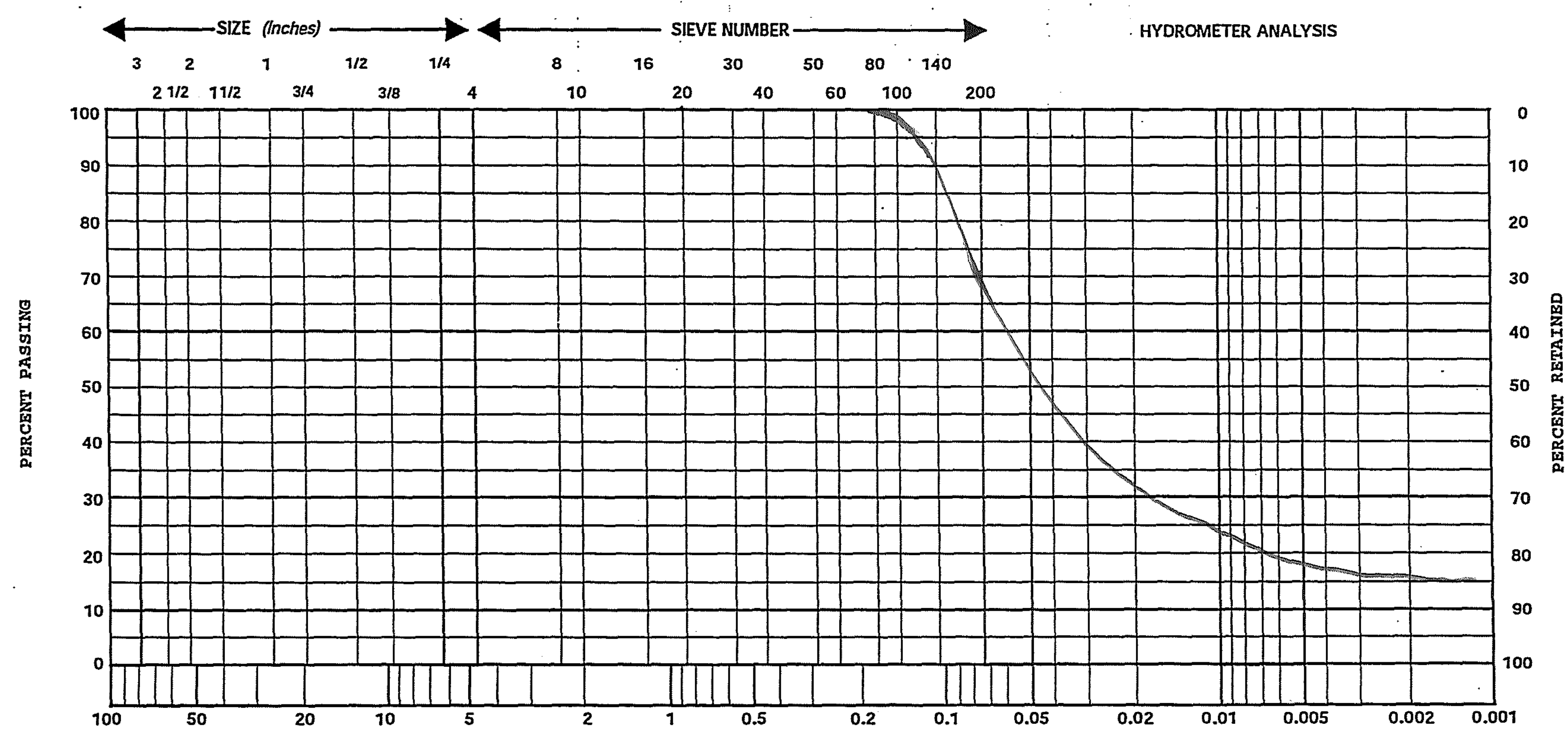
GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT Wallops Island M95 Intermodal Barge Service	2. DATE 1/25/21

SIEVE ANALYSIS - US STANDARD SIEVE SIZES



GRAIN SIZE IN MILLIMETERS

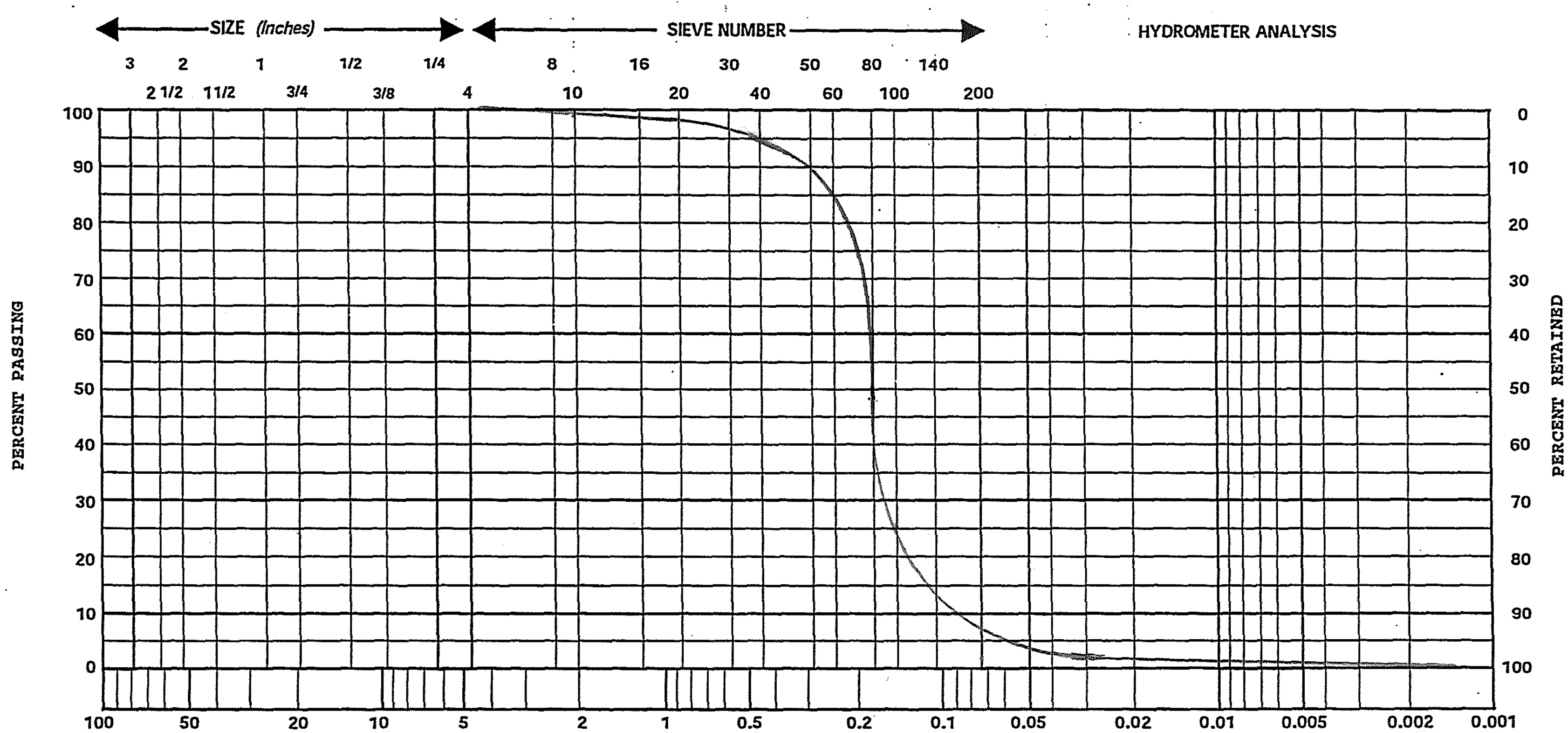
EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc $(D_{30})^2/(D_{60} \times D_{10})$	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
D4	S5	—	—	—				ML

3. TECHNICIAN (Signature)	4. PLOTTED BY (Signature)	5. CHECKED BY (Signature)
Joe Long		

GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT Wallops Island M95 Intermodal Barge Service	2. DATE 1/25/24

SIEVE ANALYSIS - US STANDARD SIEVE SIZES



GRAIN SIZE IN MILLIMETERS

EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc $(D_{30})^2/(D_{60} \times D_{10})$	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
D6	S1	NP	NP	NP				SP

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Joe Long		

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GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT	2. DATE
Wallops Island MQ5 Intermodal Barge Service	1/29/21

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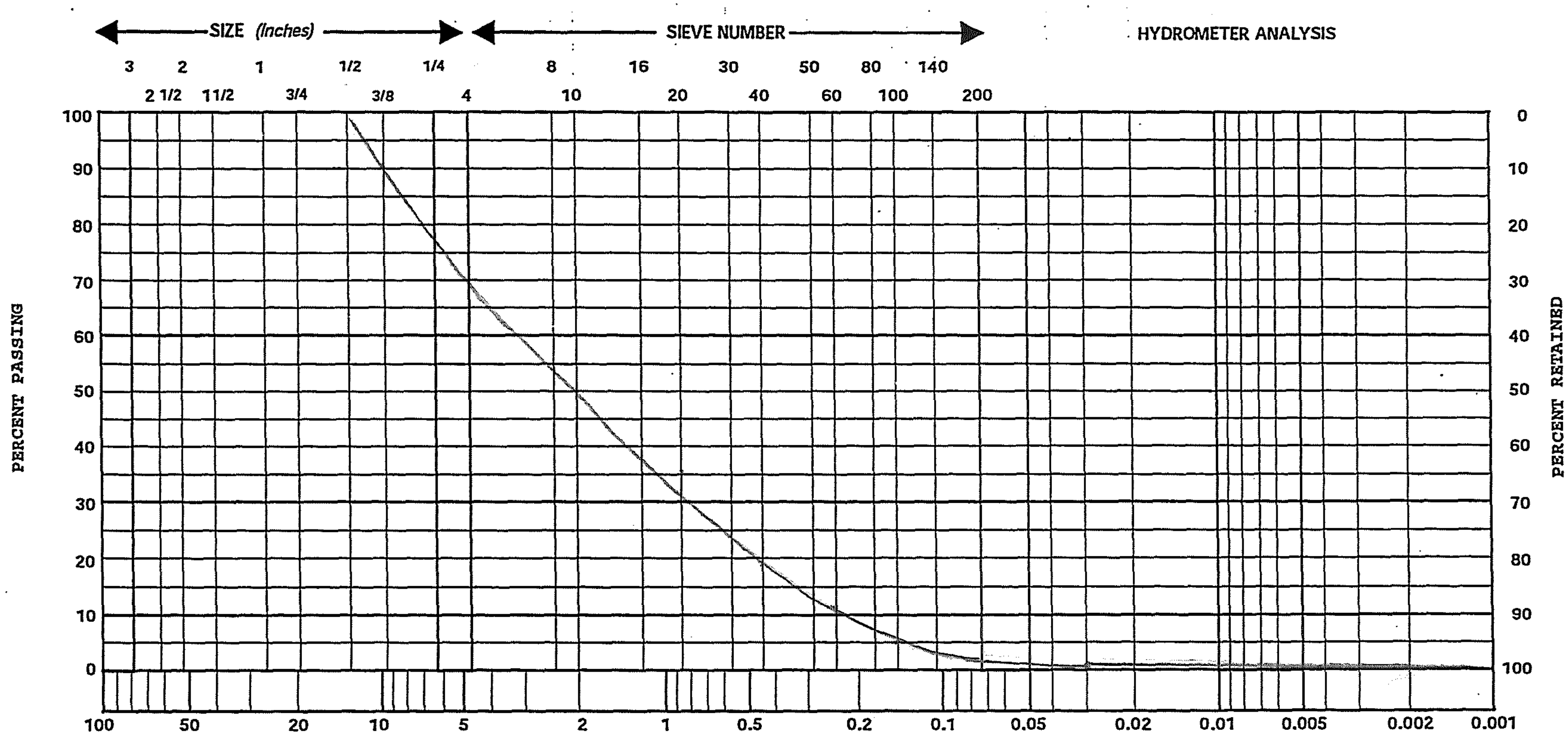

GRAIN SIZE IN MILLIMETERS

EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc $(D_{30})^2/(D_{60} \times D_{10})$	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
D6	S3	NP	NP	NP				SP

3. TECHNICIAN *(Signature)*	4. PLOTTED BY *(Signature)*	5. CHECKED BY *(Signature)*
Joe Long		

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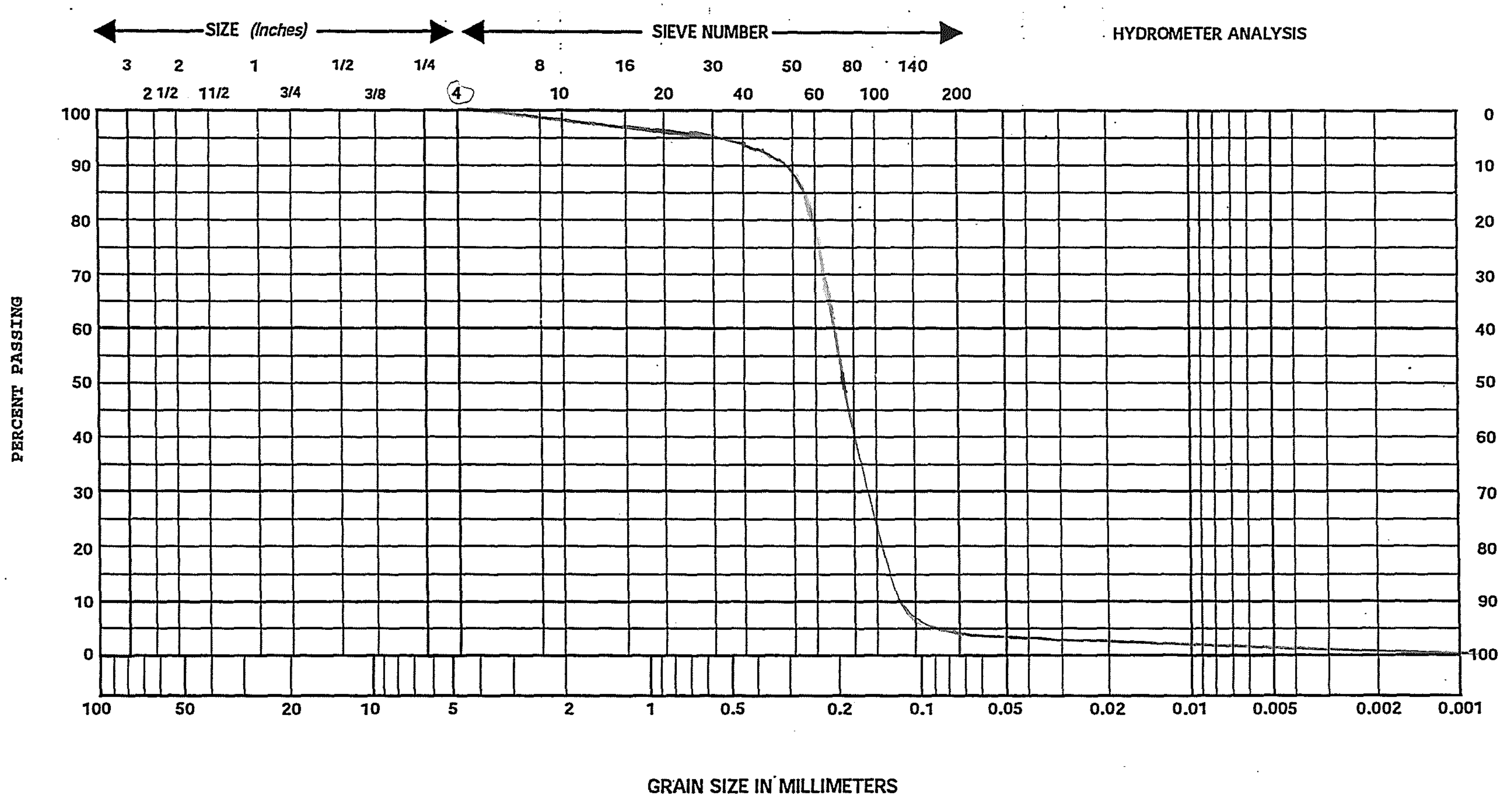
GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT Wallops Island M95 Intermodal Barge Services	2. DATE 1/29/21

SIEVE ANALYSIS - US STANDARD SIEVE SIZES



EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc $(D_{30})^2/(D_{60} \times D_{10})$	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
D9	S7	NP	NP	NP				SP

3. TECHNICIAN *(Signature)*	4. PLOTTED BY *(Signature)*	5. CHECKED BY *(Signature)*
Joe Lowy		

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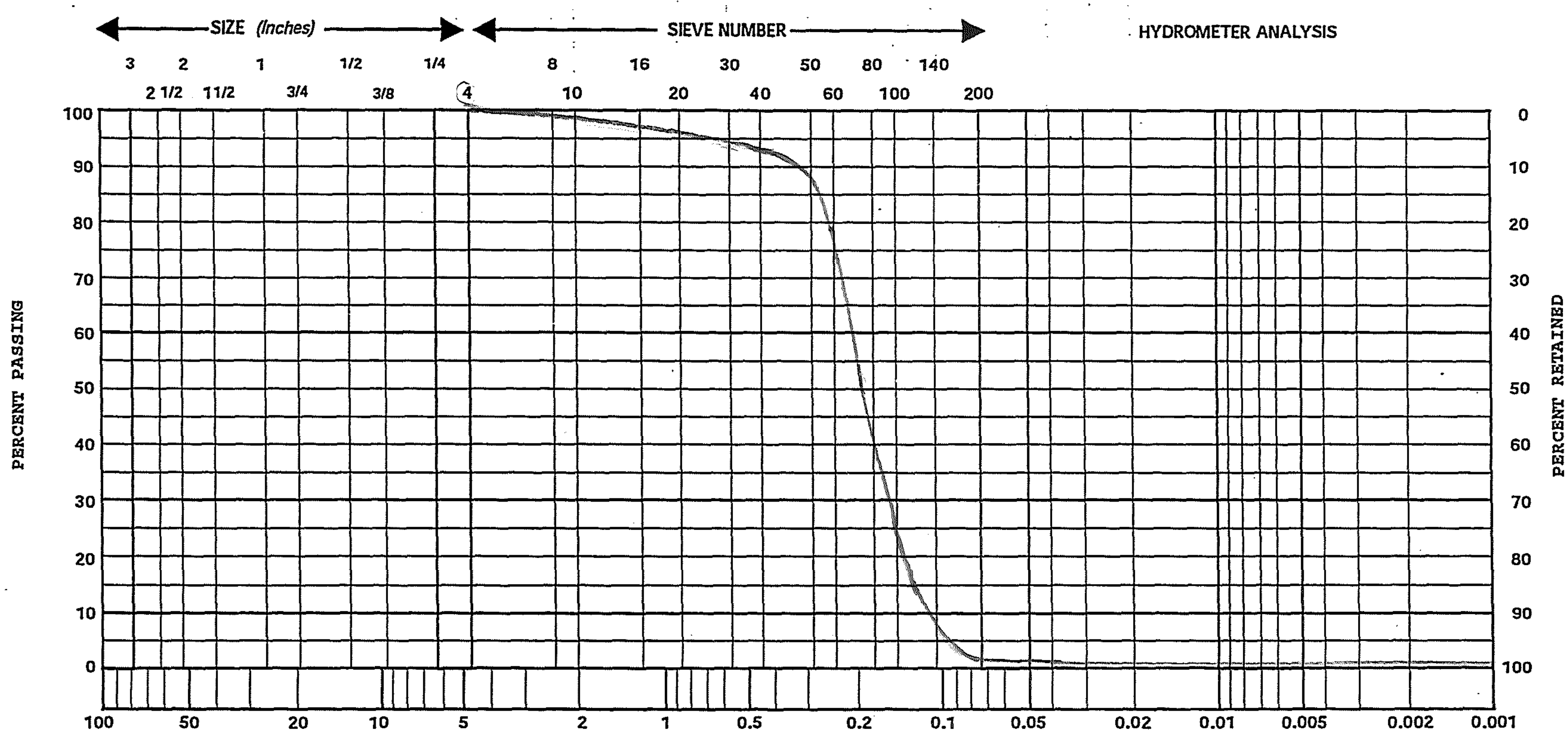
GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT	2. DATE
Wallops Island M95 Intermodal Barge Service	1/29/21

SIEVE ANALYSIS - US STANDARD SIEVE SIZES



GRAIN SIZE IN MILLIMETERS

EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc $(D_{30})^2/(D_{60} \times D_{10})$	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
D11	S5	NP	NP	NP				SP

3. TECHNICIAN *(Signature)*	4. PLOTTED BY *(Signature)*	5. CHECKED BY *(Signature)*
Joe Long		

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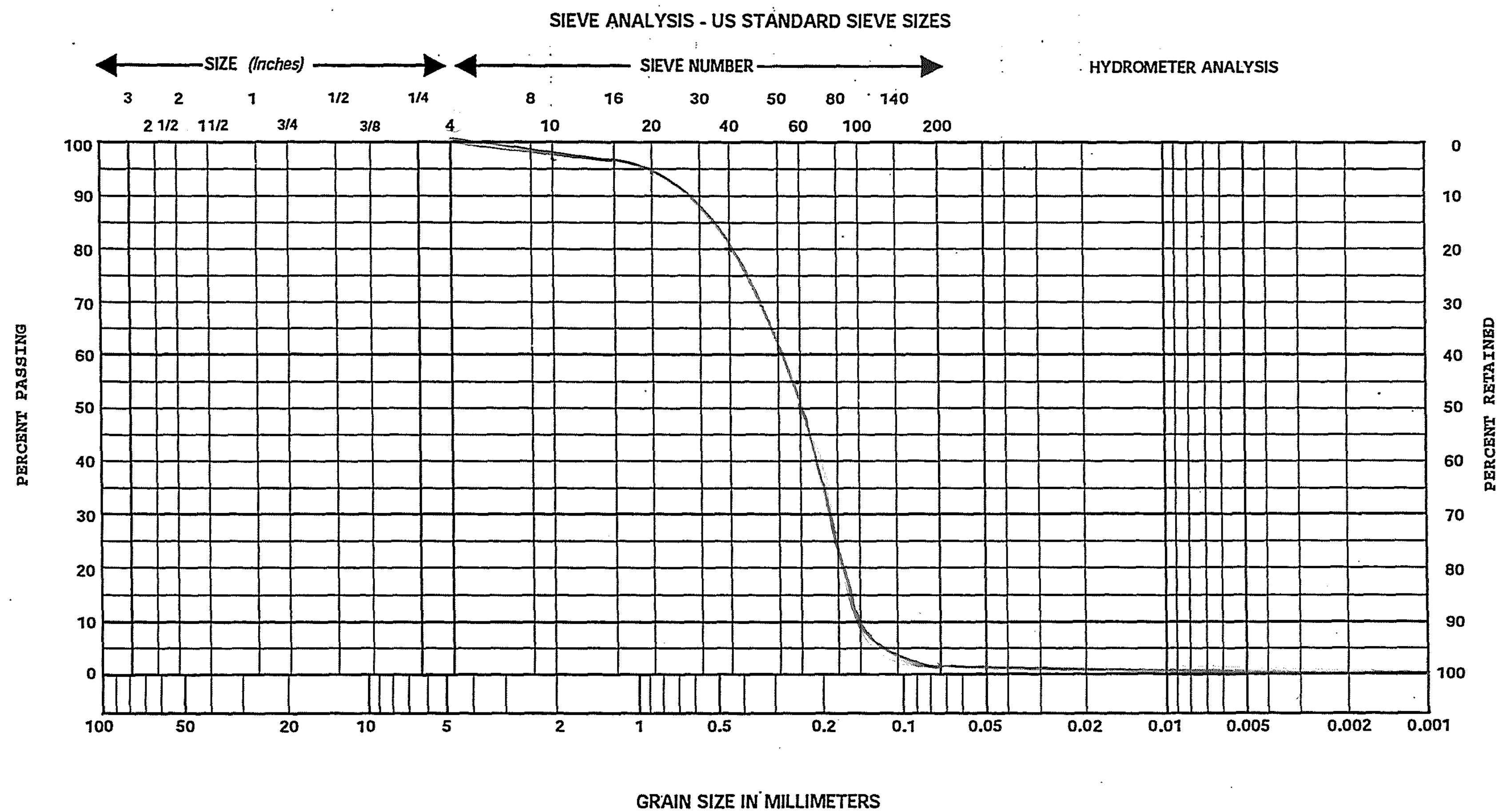
GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT Wallops Island M95 Intermodal Barge Service	2. DATE 1/25/21



EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc $(D_{30})^2/(D_{60} \times D_{10})$	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
D15	S5	NP	NP	NP				SP

3. TECHNICIAN *(Signature)*	4. PLOTTED BY *(Signature)*	5. CHECKED BY *(Signature)*
Joe Long	RP	Jeff

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EBA ENGINEERING

Project: Wallops Island M-95 Intermodal

Client: John D Hynes & Associates, Inc. **Purchase Order #** 13363

EBA Project Number: 4629-00-035

SOIL TESTING SUMMARY

Boring No.	JDH Sample Date	Depth (ft)	Specific Gravity	Moisture Content	Atterberg Limits		Dry Unit Weight
			AASHTO T100	ASTM D2166	ASTM D4813		ASTM D7262
				%	LL	PL	pcf
L-1	11/13/2020	22'-24'	2.672	26.1	NP	NP	98.0

Submitted by: Rita Patel

EBA Laboratory Chief Technician

EBA
ENGINEERING

Project: Wallops Island M-95 Intermodal

Client: John D Hynes & Associates, Inc. **Purchase Order #** 13398

EBA Project Number: 4629-00-035

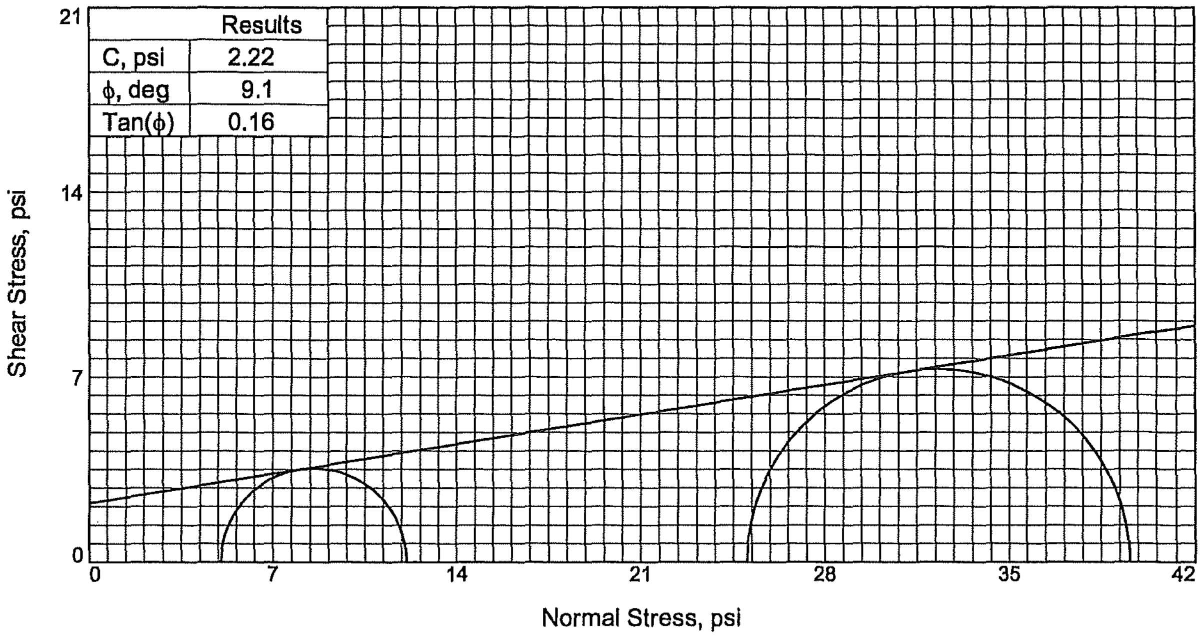
SOIL TESTING SUMMARY

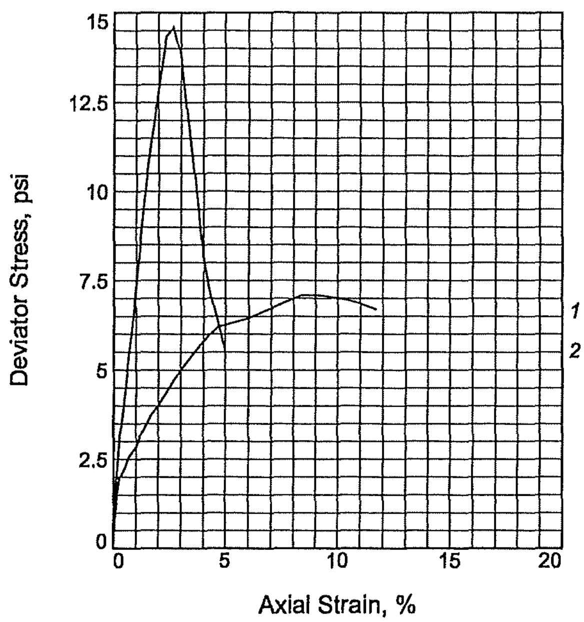
Boring No.	JDH Sample Date	Depth (ft)	Specific Gravity	Moisture Content	Atterberg Limits		Dry Unit Weight
			AASHTO T100	ASTM D2166	ASTM D4813		ASTM D7262
				%	LL	PL	pcf
P-5	12/21/2020	42'-44'	2.714	42.6	36	17	78.6

Submitted by: Rita Patel

EBA Laboratory Chief Technician

Results	
C, psi	2.22
ϕ, deg	9.1
Tan(ϕ)	0.16





	Sample No.	1	2
Initial	Water Content, %	41.5	36.7
	Dry Density, pcf	78.6	83.8
	Saturation, %	97.5	97.6
	Void Ratio	1.1563	1.0211
	Diameter, in.	2.89	2.86
	Height, in.	6.00	6.02
At Test	Water Content, %	42.6	37.6
	Dry Density, pcf	78.6	83.8
	Saturation, %	100.0	100.0
	Void Ratio	1.1563	1.0211
	Diameter, in.	2.89	2.86
	Height, in.	6.00	6.02
Strain rate, in./min.		0.045	0.045
Back Pressure, psi		0.0	0.0
Cell Pressure, psi		5.0	25.0
Fail. Stress, psi		7.1	14.6
Ult. Stress, psi			
σ_1 Failure, psi		12.1	39.6
σ_3 Failure, psi		5.0	25.0

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed Shelby tube

Description: Visual classification: sandy lean clay

LL= 36 **PL=** 17 **PI=** 19

Specific Gravity= 2.714

Remarks: Date tested: 12/29/2020

Figure ________

Client: JDH

Project: Wallops Island M-95 Intermodal

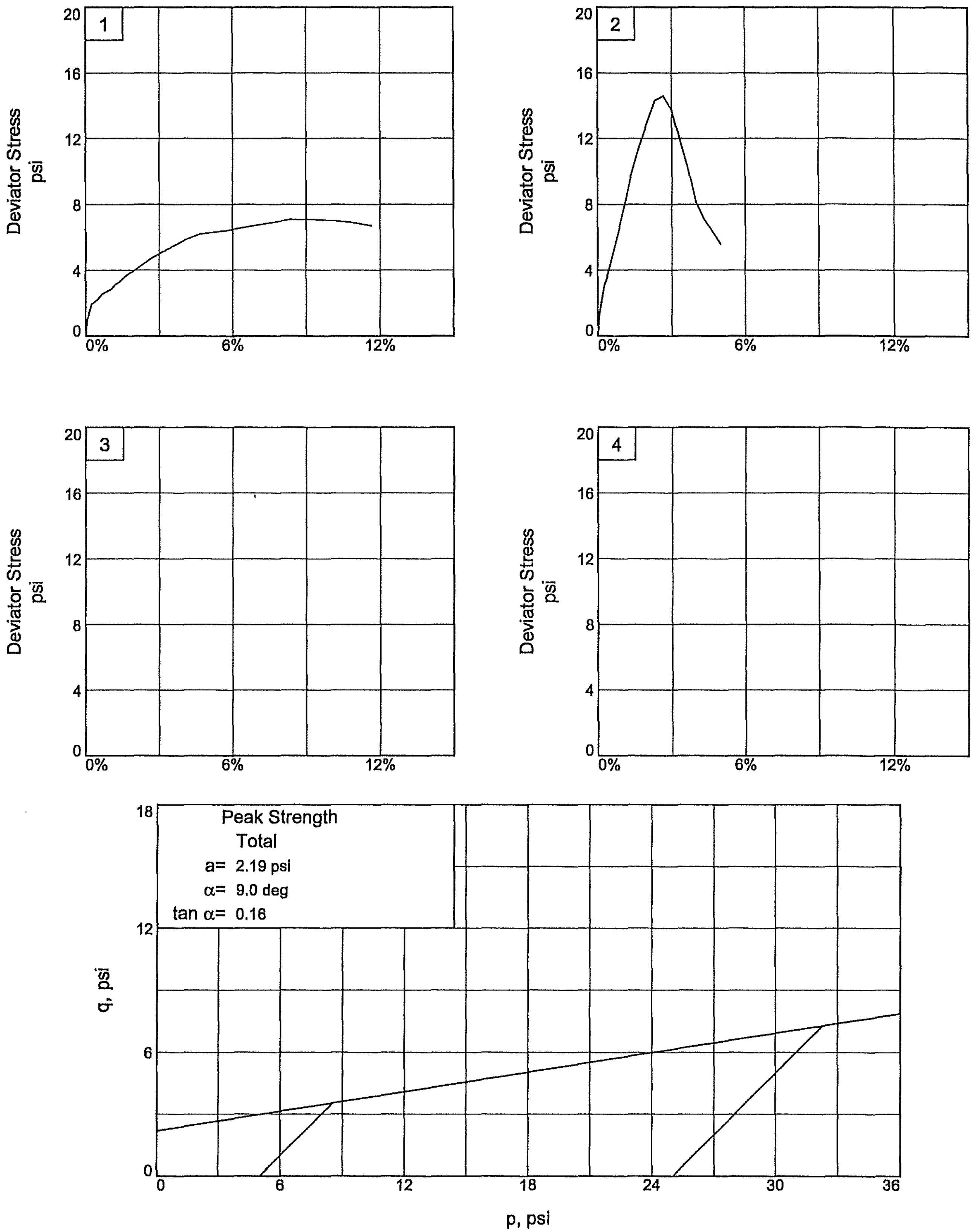
Source of Sample: P-5 **Depth:** 42'-44'

Sample Number: P-5

Proj. No.: 4629-00-035 **Date Sampled:** 12/21/2020

TRIAXIAL SHEAR TEST REPORT
EBA Engineering, Inc.
Laurel, MD

Tested By: RD **Checked By:** JK



Client: JDH
Project: Wallops Island M-95 Intermodal
Source of Sample: P-5 **Depth:** 42'-44' **Sample Number:** P-5
Project No.: 4629-00-035 **Figure** ________

EBA Engineering, Inc.

Tested By: RD **Checked By:** JK

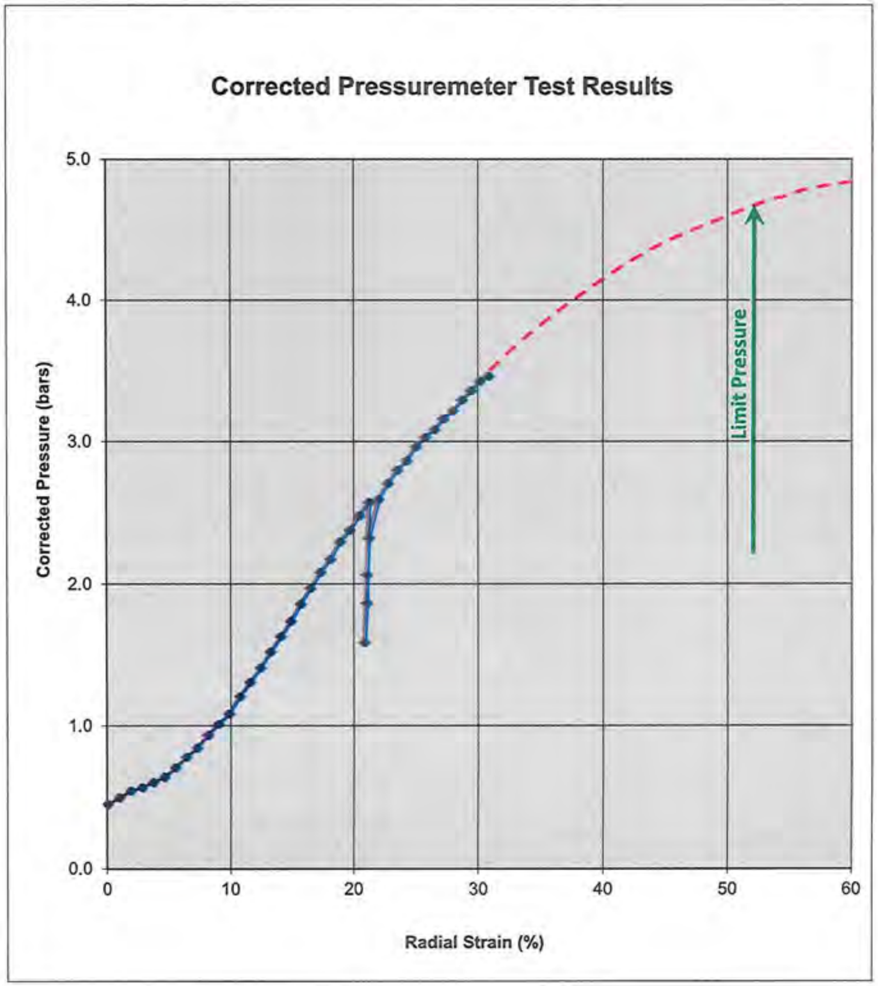
PRESSUREMETER TEST REPORT

PROJECT: Wallops Island Northern Development		BORING:	P-2
LOCATION: Wallops Island, Virginia		TEST #:	1
IN-SITU SOIL TESTING, L.C.		DEPTH:	12.9 ft
ENGINEER: Roger A. Failmezger, P.E., F. ASCE, D GE		TEST DATE:	December 29, 2020

Note: ***Depth*** refers to the distance from the ground surface to center of NX Probe.

Pressure Bar	Volume cm^3	$\Delta R/R_0$ %	Selected
0.45	0	0.00	
0.50	40	0.93	
0.55	80	1.85	
0.57	120	2.76	
0.61	160	3.67	
0.64	200	4.56	
0.71	240	5.45	
0.78	280	6.33	
0.85	319	7.21	
0.93	359	8.08	
1.01	399	8.94	
1.08	439	9.79	
1.21	479	10.64	
1.31	519	11.48	
1.41	559	12.31	
1.52	599	13.14	
1.63	639	13.96	
1.74	679	14.78	E0a
1.86	719	15.59	
1.97	759	16.39	
2.08	799	17.19	
2.17	839	17.99	
2.30	878	18.77	E0b
2.38	918	19.56	
2.48	958	20.34	
2.57	998	21.11	E1a
1.86	989	20.92	
1.59	979	20.73	E1b
2.06	989	20.92	
2.32	998	21.11	E1c
2.59	1038	21.88	
2.71	1078	22.64	
2.80	1118	23.40	
2.87	1158	24.15	
2.96	1198	24.90	
3.03	1238	25.65	
3.08	1278	26.39	
3.16	1318	27.13	
3.22	1358	27.86	
3.29	1398	28.59	
3.36	1438	29.31	
3.42	1478	30.03	
3.46	1518	30.75	

	Interpreted Pressuremeter Parameters		
	P_o	0.8	bar
	Limit Pressure Strain	52.0%	
	P_L	4.7	bar
	P_L^*	3.9	bar
	E_o	22	bar
	E_o/P_L^*	5.6	bar
Loop #	Unload Modulus	Reload Modulus	
1	422	313	bar
2	#DIV/0!	#DIV/0!	bar
3	#DIV/0!	#DIV/0!	bar



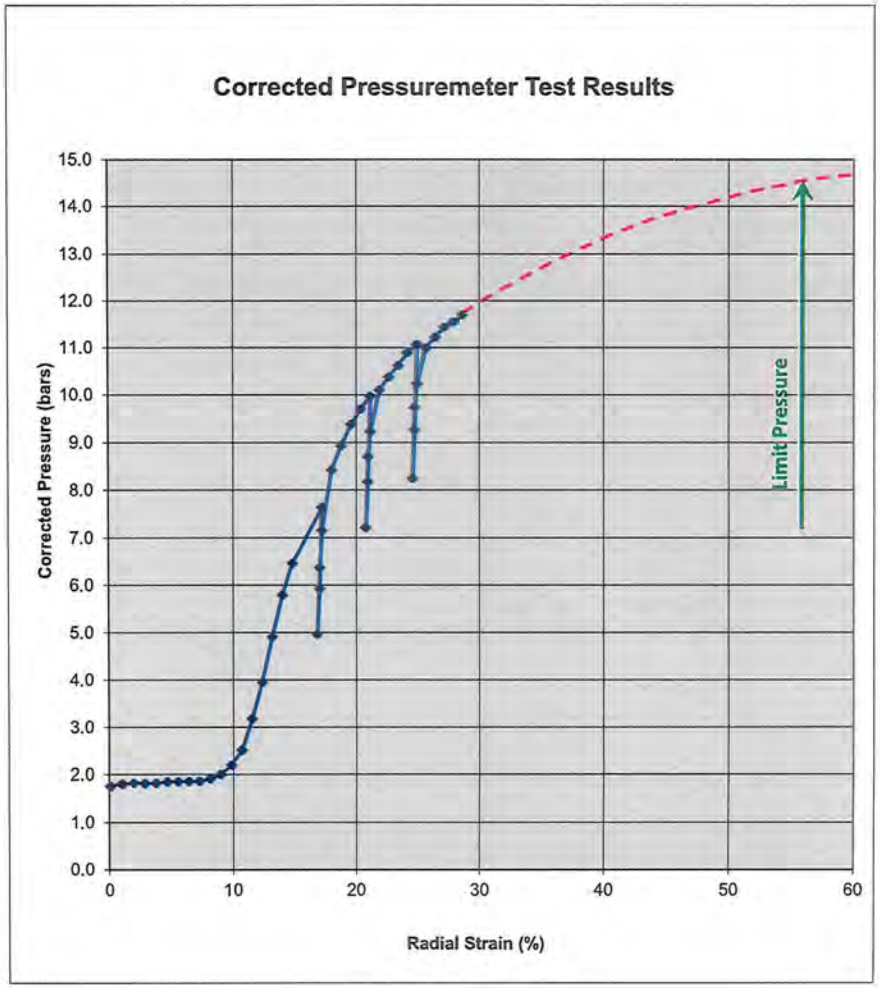
PRESSUREMETER TEST REPORT

PROJECT: Wallops Island Northern Development		BORING:	P-2
LOCATION: Wallops Island, Virginia		TEST #:	1
IN-SITU SOIL TESTING, L.C.		DEPTH:	55.5 ft
ENGINEER: Roger A. Failmezger, P.E., F. ASCE, D GE		TEST DATE:	December 29, 2020

Note: ***Depth*** refers to the distance from the ground surface to center of NX Probe.

Pressure Bar	Volume cm³	$\Delta R/R_0$ %	Selected
1.76	0	0.00	
1.81	40	0.93	
1.83	80	1.85	
1.82	120	2.76	
1.83	160	3.67	
1.85	200	4.56	
1.86	240	5.46	
1.86	280	6.34	
1.87	320	7.21	
1.92	360	8.08	
2.00	400	8.94	
2.20	439	9.79	
2.52	479	10.64	
3.18	519	11.47	
3.96	558	12.30	E0a
4.91	598	13.11	
5.80	637	13.92	E0b
6.46	677	14.73	
7.63	796	17.14	E1a
5.94	787	16.95	
4.97	777	16.77	E1b
6.37	787	16.95	
7.15	796	17.14	E1c
8.43	835	17.92	
8.94	875	18.70	
9.38	915	19.48	
9.70	954	20.26	
9.97	994	21.03	E2a
8.18	985	20.86	
7.22	976	20.68	E2b
8.71	985	20.85	
9.23	995	21.04	E2c
10.11	1034	21.80	
10.38	1074	22.56	
10.62	1114	23.32	
10.89	1154	24.07	
11.06	1194	24.82	E3a
9.27	1184	24.65	
8.25	1175	24.48	E3b
9.74	1184	24.65	
10.23	1194	24.83	E3c
10.99	1234	25.57	
11.22	1273	26.31	
11.43	1313	27.04	
11.54	1353	27.78	
11.69	1393	28.50	

Loop #	Interpreted Pressuremeter Parameters		
	P_o	2.0	bar
	Limit Pressure Strain	55.8%	
	P_L	14.5	bar
	P_L^*	12.5	bar
	E_o	170	bar
	E_o/P_L^*	13.6	bar
Loop #	Unload Modulus	Reload Modulus	
1	1123	906	bar
2	1244	887	bar
3	1355	929	bar

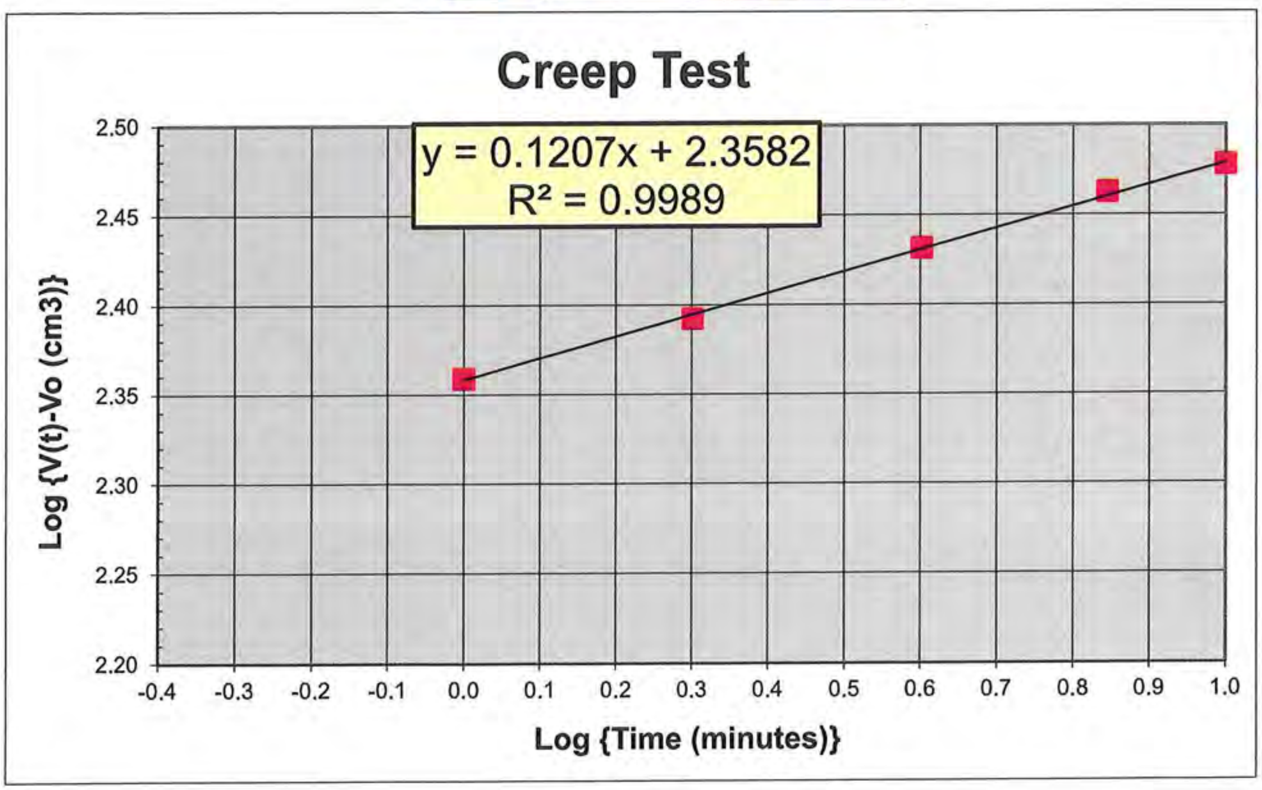


Pressuremeter Creep Test

Project: Wallops Island Northern Development
Sounding No.: P-2
Test Depth: 55.5 feet
Holding Gauge Pressure = 5.15 bars
Corrected Pressure = 6.42 bars
Initial Probe Radius = 3.69 cm
Initial Probe Length = 50 cm
Initial Volume of Probe = 2139 cm^3
Probe Radius Contacting Borehole = 4.08 cm
Initial Borehole Volume, Vo = 2612 cm^3

Time (minutes)	Log (Time) (minutes)	Volume Increase (cm^3)	Total Probe Volume (cm^3)	$V(t)-V_0$ (cm^3)	Log $[V(t)-V_0]$ (cm^3)
1	0.000	701.38	2840.19	228.65	2.359
2	0.301	719.65	2858.46	246.92	2.393
4	0.602	742.73	2881.54	270.00	2.431
7	0.845	762.58	2901.39	289.85	2.462
10	1.000	773.07	2911.88	300.34	2.478

$E_0(t)/E_0(t=1\text{ min}) = \{t/1\}^{-n}$
n = 0.1207

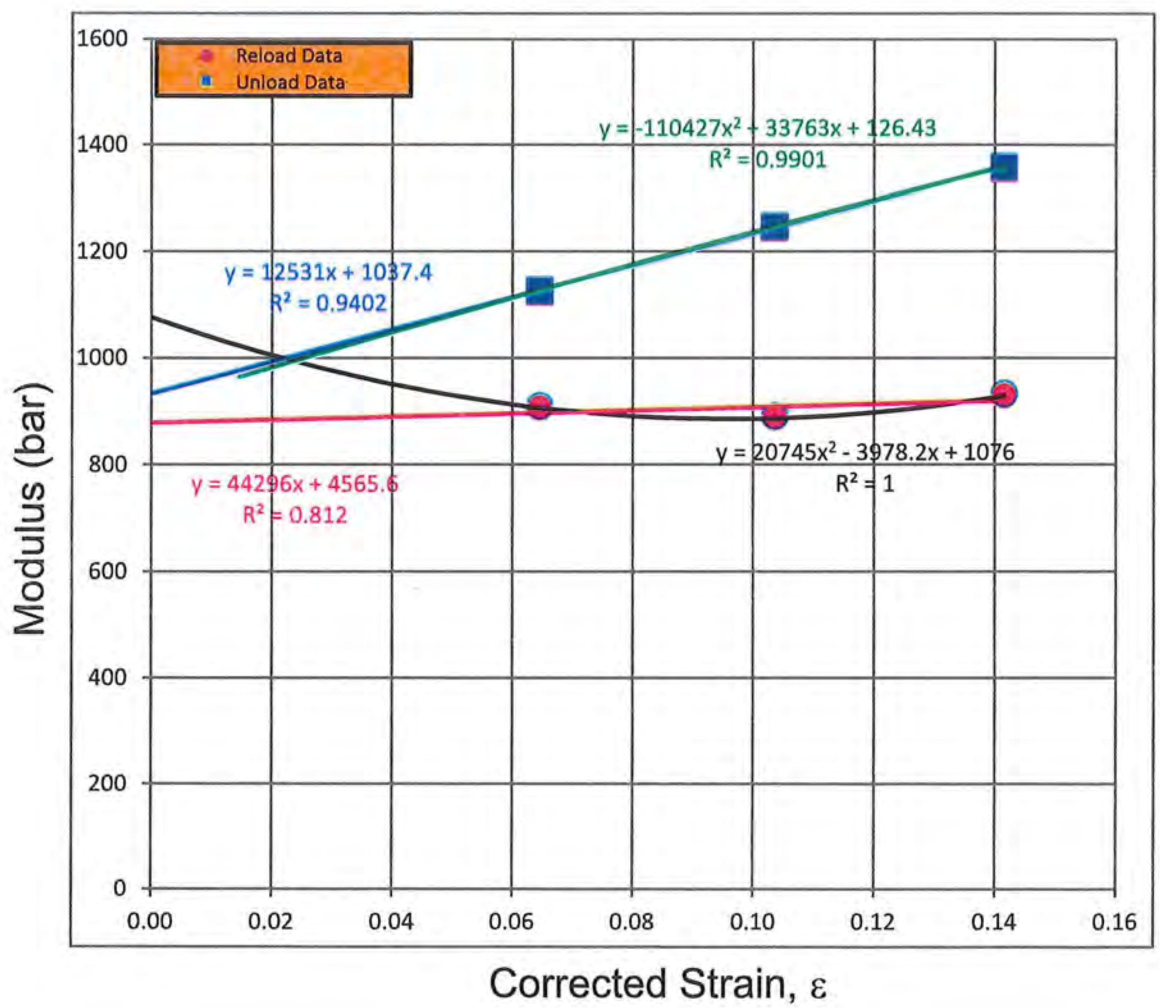


RELOAD/UNLOAD MODULUS ANALYSES

PROJECT:	Wallops Island Northern Development	BORING:	P-2
LOCATION:	Wallops Island, Virginia	TEST #:	1
IN-SITU SOIL TESTING, L.C.		DEPTH:	55.5 ft
ENGINEER:	Roger A. Failmezger, P.E., F. ASCE, D GE	TEST DATE:	12/29/2020

Strain to contact borehole = 0.105

Average Strain	Corrected Strain	Reload Modulus	Average Strain	Corrected Strain	Unload Modulus
0.1695	0.0645	906	0.1695	0.0645	1123
0.2086	0.1036	887	0.2085	0.1035	1244
0.2465	0.1415	929	0.2465	0.1415	1355



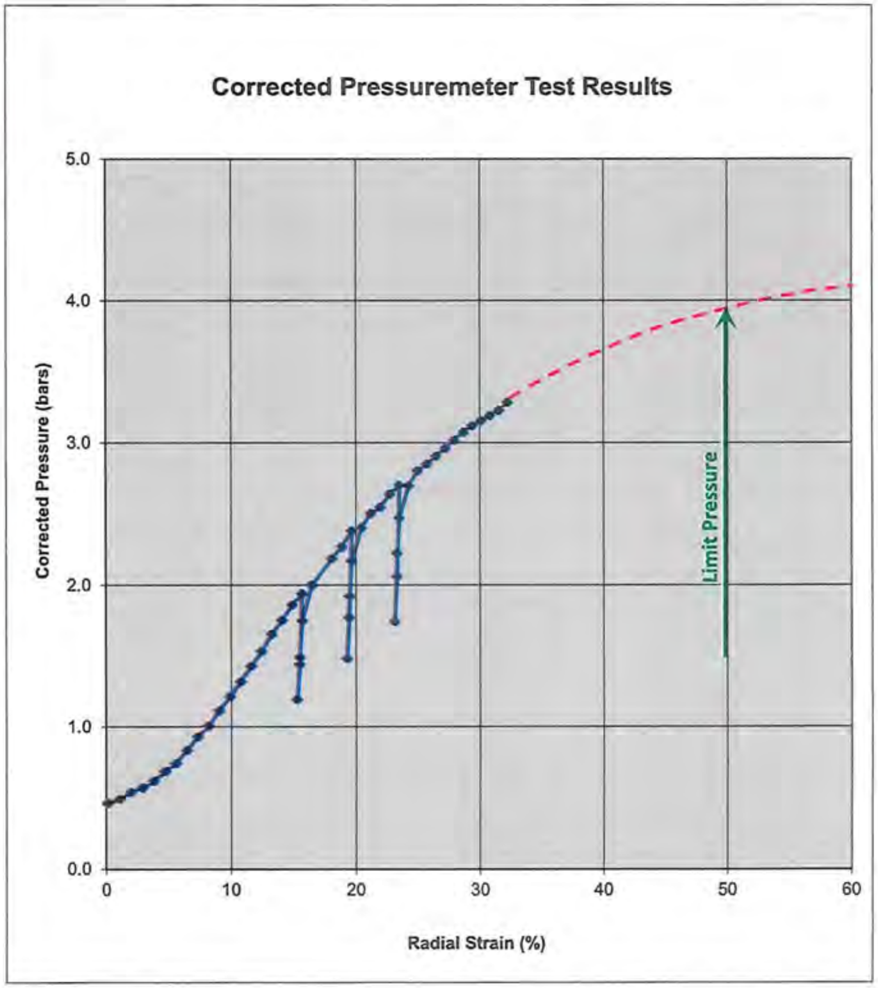
PRESSUREMETER TEST REPORT

PROJECT: Wallops Island Northern Development		BORING:	P-2A
LOCATION: Wallops Island, Virginia		TEST #:	1
IN-SITU SOIL TESTING, L.C.		DEPTH:	14.0 ft
ENGINEER: Roger A. Failmezger, P.E., F. ASCE, D GE		TEST DATE:	December 30, 2020

Note: ***Depth*** refers to the distance from the ground surface to center of NX Probe.

Pressure Bar	Volume cm³	ΔR/R₀ %	Selected
0.46	0	0.00	
0.49	40	0.93	
0.54	80	1.85	
0.57	120	2.76	
0.62	160	3.67	
0.68	200	4.56	
0.74	240	5.45	
0.83	280	6.33	
0.93	319	7.21	
1.01	359	8.08	
1.11	399	8.94	
1.22	439	9.79	
1.32	479	10.64	
1.43	519	11.48	
1.53	559	12.31	E0a
1.65	599	13.14	
1.75	639	13.96	
1.86	679	14.78	E0b
1.94	719	15.59	E1a
1.44	709	15.39	
1.19	699	15.19	E1b
1.49	709	15.39	
1.75	719	15.59	E1c
2.00	759	16.39	
2.19	839	17.99	
2.27	879	18.78	
2.38	918	19.56	E2a
1.77	909	19.37	
1.48	899	19.18	E2b
1.92	909	19.37	
2.17	919	19.56	E2c
2.40	958	20.34	
2.50	998	21.11	
2.55	1038	21.88	
2.64	1078	22.64	
2.70	1118	23.40	E3a
2.06	1109	23.22	
1.74	1099	23.03	E3b
2.22	1109	23.22	
2.47	1118	23.41	E3c
2.70	1158	24.16	
2.80	1198	24.91	
2.85	1238	25.65	
2.91	1278	26.39	
2.96	1318	27.13	
3.02	1358	27.86	
3.07	1398	28.59	
3.12	1438	29.32	
3.16	1478	30.04	
3.19	1518	30.75	
3.23	1558	31.47	
3.28	1598	32.18	

	Interpreted Pressuremeter Parameters		
	P_o	0.8	bar
	Limit Pressure Strain	49.7%	
	P_L	3.9	bar
	P_L^*	3.1	bar
	E_o	20	bar
	E_o/P_L^*	6.5	bar
Loop #	Unload Modulus	Reload Modulus	
1	289	214	bar
2	373	283	bar
3	426	321	bar

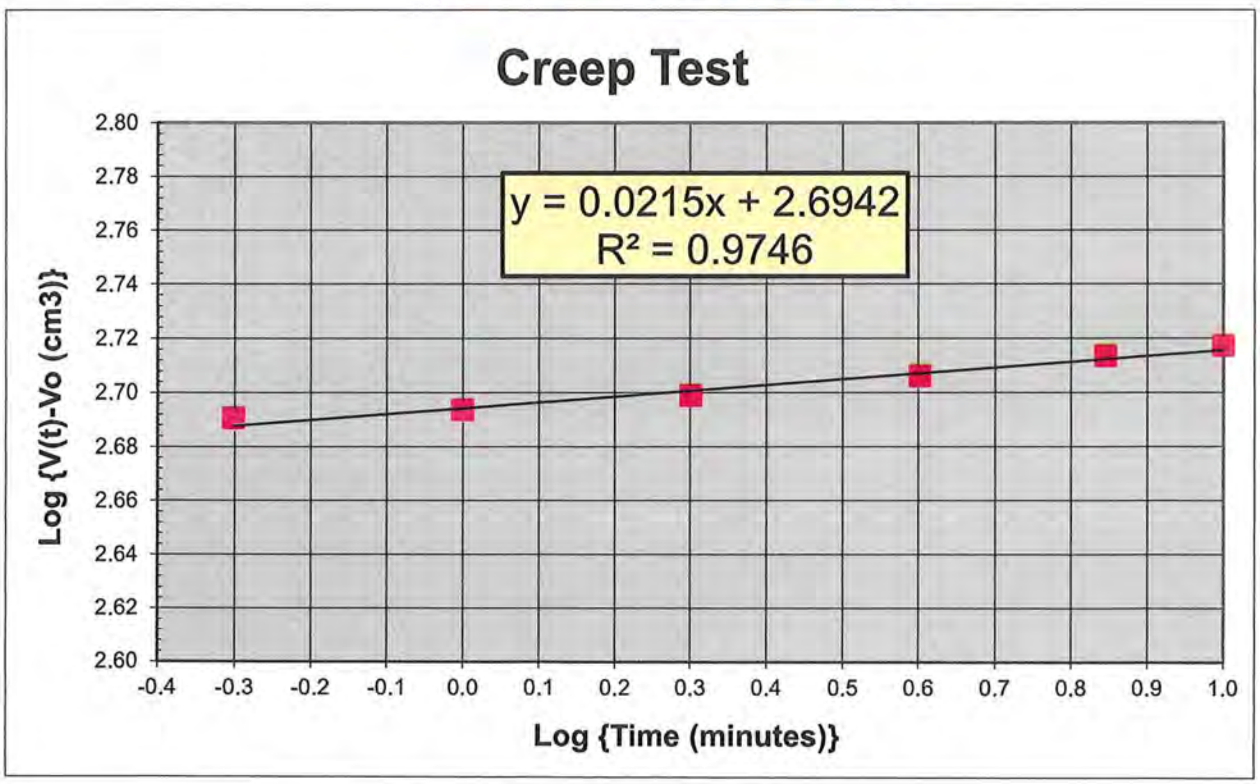


Pressuremeter Creep Test

Project: Wallops Island Northern Development
Sounding No.: P-2A
Test Depth: 14.0 feet
Holding Gauge Pressure = 1.95 bars
Corrected Pressure = 2.00 bars
Initial Probe Radius = 3.69 cm
Initial Probe Length = 50 cm
Initial Volume of Probe = 2139 cm^3
Probe Radius Contacting Borehole = 3.92 cm
Initial Borehole Volume, Vo = 2412 cm^3

Time (minutes)	Log (Time) (minutes)	Volume Increase (cm^3)	Total Probe Volume (cm^3)	$V(t)-V_0$ (cm^3)	Log $[V(t)-V_0]$ (cm^3)
0.5	-0.301	763.12	2901.93	489.69	2.690
1	0.000	766.85	2905.66	493.42	2.693
2	0.301	772.87	2911.68	499.44	2.698
4	0.602	781.23	2920.04	507.80	2.706
7	0.845	789.98	2928.79	516.55	2.713
10	1.000	794.72	2933.53	521.29	2.717

$E_0(t)/E_0(t=1\ \text{min}) = \{t/1\}^{-n}$
n = 0.0215

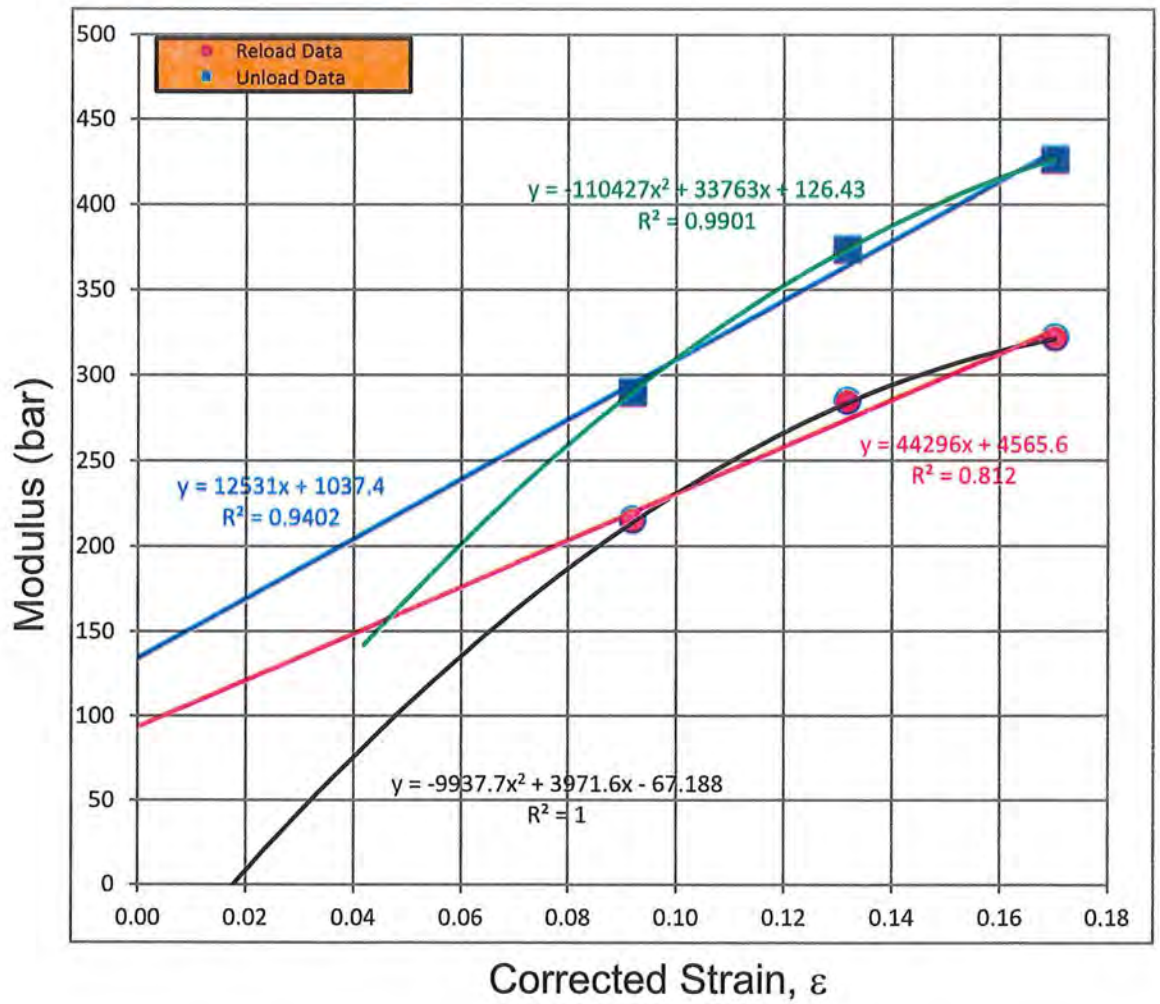


RELOAD/UNLOAD MODULUS ANALYSES

PROJECT:	Wallops Island Northern Development	BORING:	P-2A
LOCATION:	Wallops Island, Virginia	TEST #:	1
IN-SITU SOIL TESTING, L.C.		DEPTH:	14.0 ft
ENGINEER:	Roger A. Failmezger, P.E., F. ASCE, D GE	TEST DATE:	12/30/2020

Strain to contact borehole = 0.062

Average Strain	Corrected Strain	Reload Modulus	Average Strain	Corrected Strain	Unload Modulus
0.1539	0.0919	214	0.1539	0.0919	289
0.1937	0.1317	283	0.1937	0.1317	373
0.2322	0.1702	321	0.2322	0.1702	426



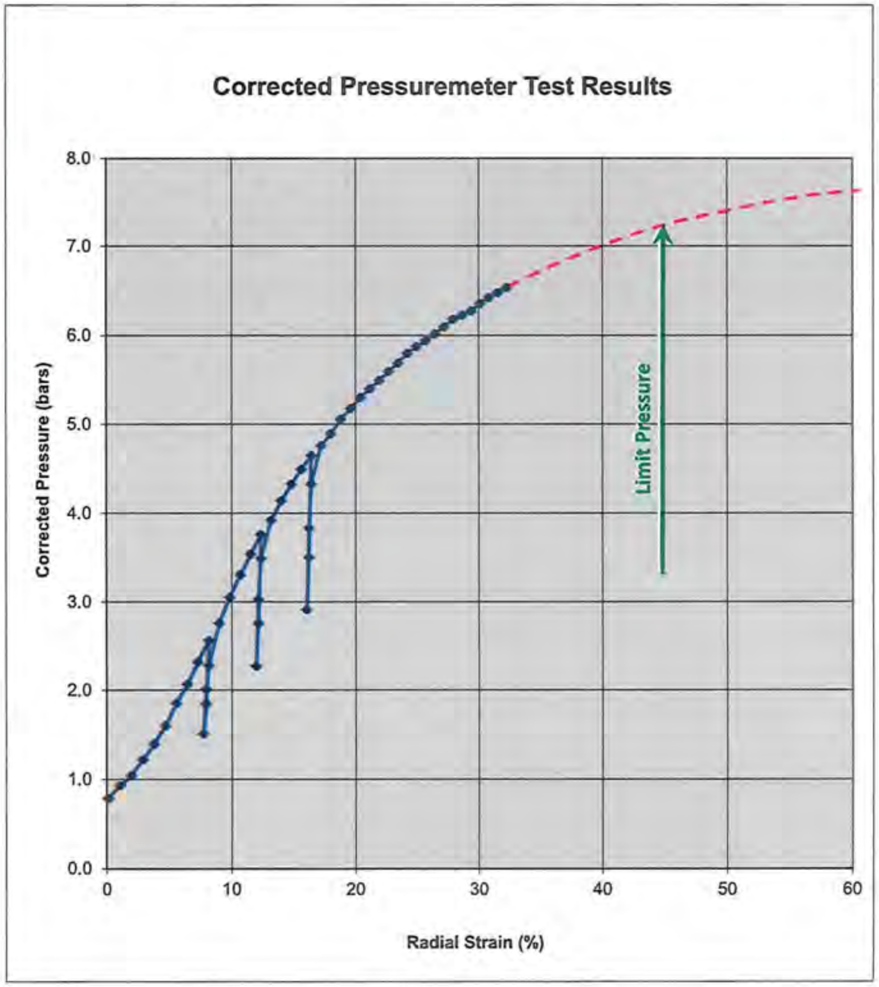
PRESSUREMETER TEST REPORT

PROJECT: Wallops Island Northern Development		BORING:	P-2A
LOCATION: Wallops Island, Virginia		TEST #:	2
IN-SITU SOIL TESTING, L.C.		DEPTH:	24.0 ft
ENGINEER: Roger A. Failmezger, P.E., F. ASCE, D GE		TEST DATE:	December 30, 2020

Note: ***Depth*** refers to the distance from the ground surface to center of NX Probe.

Pressure Bar	Volume cm^3	$\Delta R/R_o$ %	Selected
0.78	0	0.00	
0.93	40	0.93	
1.04	80	1.85	
1.22	120	2.76	
1.40	159	3.66	
1.60	199	4.55	E0a
1.86	239	5.44	
2.07	279	6.32	
2.33	319	7.19	E0b
2.56	359	8.06	E1a
1.85	349	7.85	
1.51	339	7.64	E1b
2.02	349	7.85	
2.28	359	8.06	E1c
2.76	398	8.92	
3.05	438	9.77	
3.31	478	10.61	
3.54	518	11.45	
3.76	558	12.29	E2a
2.76	548	12.09	
2.27	539	11.89	E2b
3.03	548	12.09	
3.49	558	12.29	E2c
3.92	598	13.11	
4.14	638	13.93	
4.33	677	14.75	
4.50	717	15.56	
4.65	757	16.36	E3a
3.50	748	16.17	
2.91	738	15.98	E3b
3.83	748	16.17	
4.33	757	16.37	E3c
4.76	797	17.16	
4.89	837	17.95	
5.06	877	18.74	
5.18	917	19.53	
5.30	957	20.30	
5.40	997	21.08	
5.49	1037	21.85	
5.60	1077	22.61	
5.69	1116	23.37	
5.80	1156	24.12	
5.87	1196	24.87	
5.94	1236	25.62	
6.01	1276	26.36	
6.09	1316	27.10	
6.18	1356	27.83	
6.22	1396	28.56	
6.27	1436	29.28	
6.35	1476	30.00	
6.42	1516	30.72	
6.48	1556	31.43	
6.53	1596	32.14	

	Interpreted Pressuremeter Parameters		
	P_o	1.2	bar
	Limit Pressure Strain	44.5%	
	P_L	7.2	bar
	P_L^*	6.0	bar
	E_o	39	bar
	E_o/P_L^*	6.4	bar
Loop #	Unload Modulus	Reload Modulus	
1	360	262	bar
2	555	450	bar
3	702	566	bar

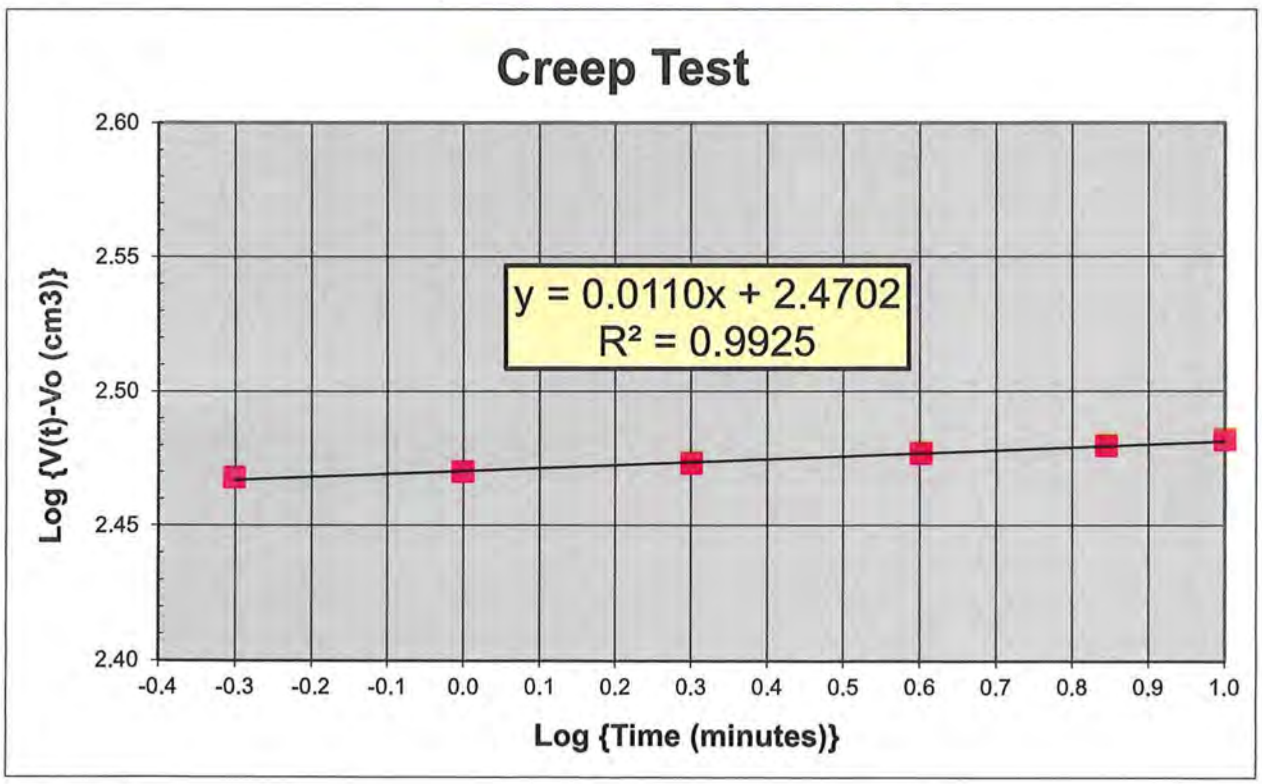


Pressuremeter Creep Test

Project: Wallops Island Northern Development
Sounding No.: P-2A
Test Depth: 24.0 feet
Holding Gauge Pressure = 2.33 bars
Corrected Pressure = 2.76 bars
Initial Probe Radius = 3.69 cm
Initial Probe Length = 50 cm
Initial Volume of Probe = 2139 cm^3
Probe Radius Contacting Borehole = 3.78 cm
Initial Borehole Volume, Vo = 2247 cm^3

Time (minutes)	Log (Time) (minutes)	Volume Increase (cm^3)	Total Probe Volume (cm^3)	$V(t)-V_0$ (cm^3)	Log $[V(t)-V_0]$ (cm^3)
0.5	-0.301	401.73	2540.54	293.45	2.468
1	0.000	403.28	2542.09	295.00	2.470
2	0.301	405.41	2544.22	297.13	2.473
4	0.602	407.93	2546.74	299.65	2.477
7	0.845	409.85	2548.66	301.57	2.479
10	1.000	411.44	2550.25	303.16	2.482

$E_0(t)/E_0(t=1\text{ min}) = \{t/1\}^{-n}$
n = 0.0110

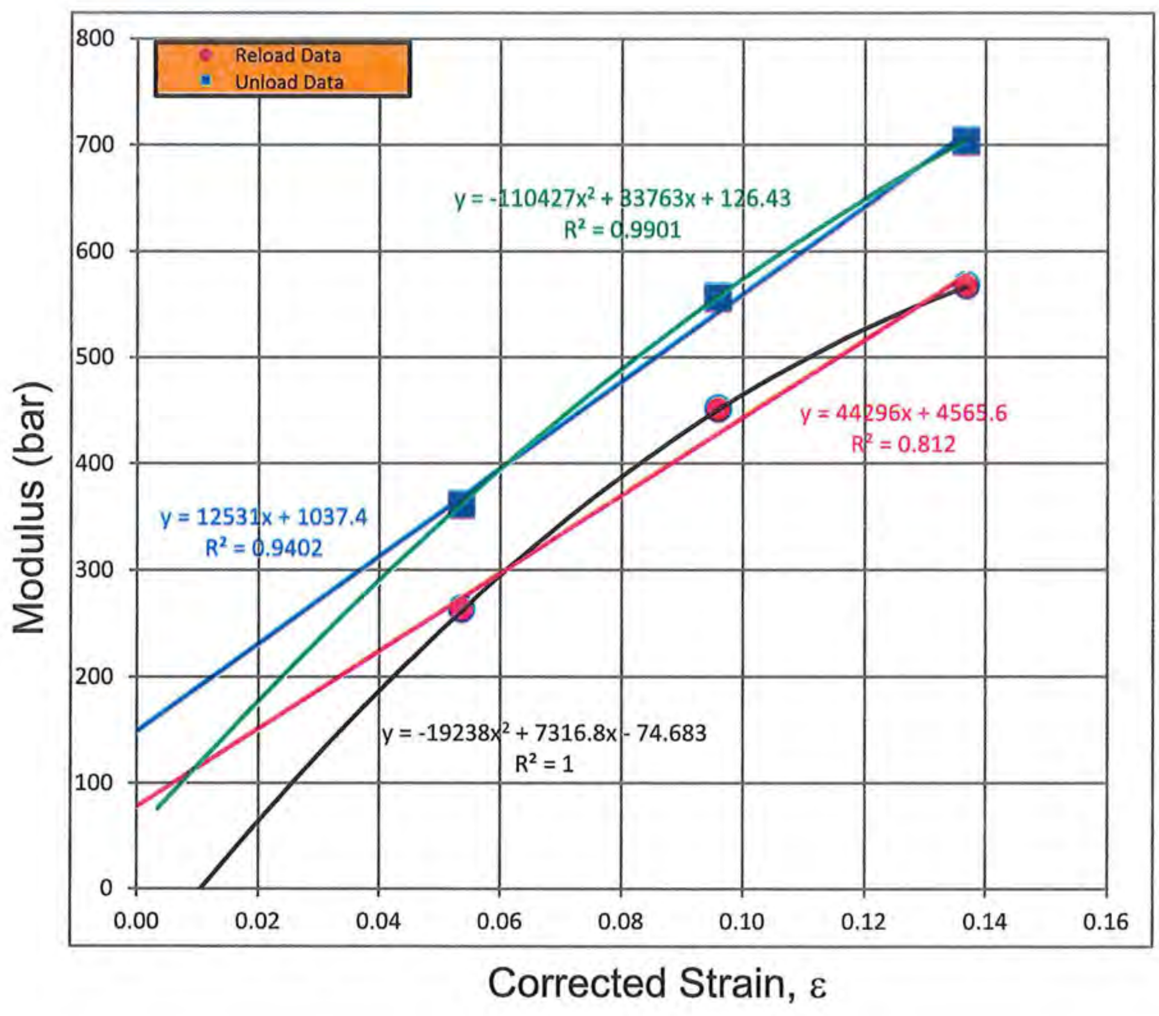


RELOAD/UNLOAD MODULUS ANALYSES

PROJECT:	Wallops Island Northern Development	BORING:	P-2A
LOCATION:	Wallops Island, Virginia	TEST #:	2
IN-SITU SOIL TESTING, L.C.		DEPTH:	24.0 ft
ENGINEER:	Roger A. Failmezger, P.E., F. ASCE, D GE	TEST DATE:	12/30/2020

Strain to contact borehole = 0.025

Average Strain	Corrected Strain	Reload Modulus	Average Strain	Corrected Strain	Unload Modulus
0.0785	0.0535	262	0.0785	0.0535	360
0.1209	0.0959	450	0.1209	0.0959	555
0.1617	0.1367	566	0.1617	0.1367	702



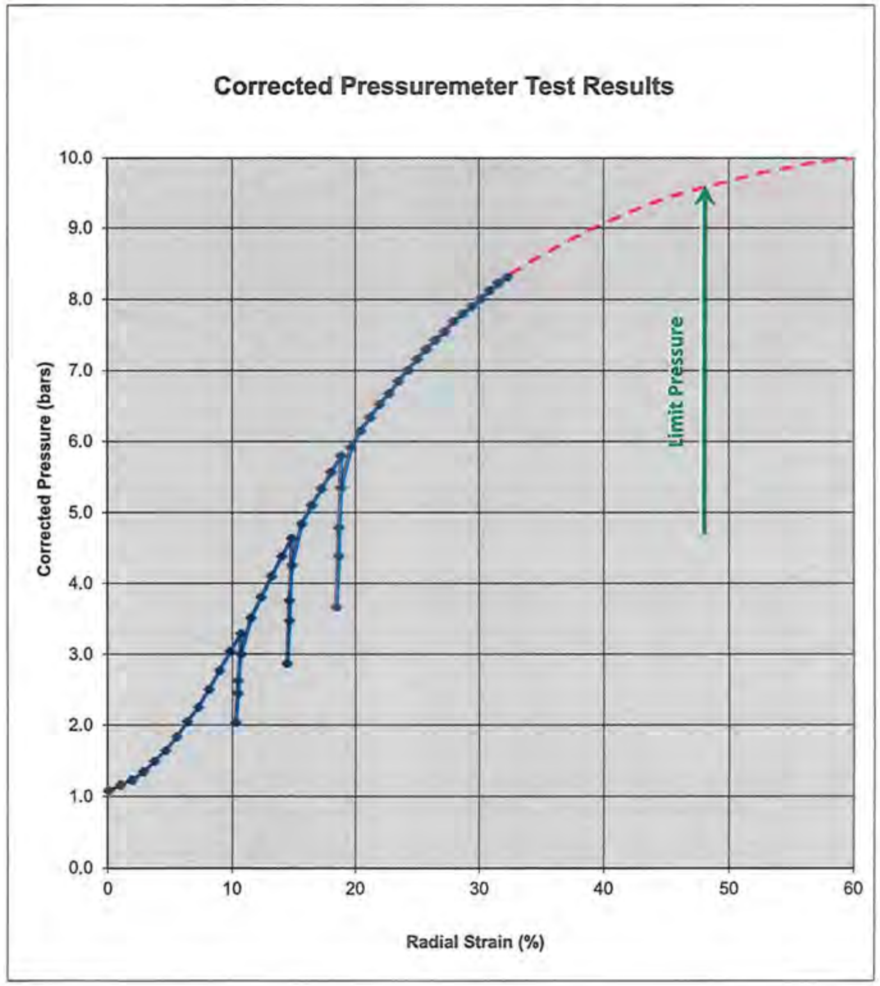
PRESSUREMETER TEST REPORT

PROJECT: Wallops Island Northern Development		BORING:	P-2A
LOCATION: Wallops Island, Virginia		TEST #:	3
IN-SITU SOIL TESTING, L.C.		DEPTH:	35.0 ft
ENGINEER: Roger A. Failmezger, P.E., F. ASCE, D GE		TEST DATE:	December 30, 2020

Note: ***Depth*** refers to the distance from the ground surface to center of NX Probe.

Pressure Bar	Volume cm^3	$\Delta R/R_o$ %	Selected
1.08	0	0.00	
1.16	40	0.93	
1.23	80	1.85	
1.34	120	2.76	
1.49	160	3.66	
1.64	199	4.56	
1.84	239	5.45	
2.05	279	6.33	
2.26	319	7.20	E0a
2.50	359	8.06	
2.77	399	8.92	
3.04	438	9.77	E0b
3.30	478	10.62	E1a
2.45	469	10.42	
2.04	459	10.21	E1b
2.63	469	10.42	
3.01	479	10.62	E1c
3.52	518	11.46	
3.81	558	12.29	
4.10	598	13.11	
4.38	638	13.93	
4.64	677	14.75	E2a
3.48	668	14.56	
2.87	658	14.36	E2b
3.76	668	14.56	
4.26	678	14.75	E2c
4.84	717	15.56	
5.10	757	16.36	
5.33	797	17.16	
5.56	837	17.95	
5.80	877	18.74	E3a
4.39	867	18.55	
3.67	858	18.37	E3b
4.79	867	18.55	
5.35	877	18.74	E3c
5.92	917	19.52	
6.15	956	20.30	
6.34	996	21.07	
6.52	1036	21.84	
6.68	1076	22.60	
6.85	1116	23.36	
7.01	1156	24.11	
7.16	1196	24.86	
7.30	1236	25.61	
7.42	1276	26.35	
7.54	1315	27.08	
7.69	1355	27.82	
7.79	1395	28.54	
7.90	1435	29.27	
8.00	1475	29.99	
8.12	1515	30.70	
8.23	1555	31.42	
8.31	1595	32.12	

	Interpreted Pressuremeter Parameters		
	P_o	1.5	bar
	Limit Pressure Strain	47.8%	
	P_L	9.6	bar
	P_L^*	8.1	bar
	E_o	44	bar
	E_o/P_L^*	5.5	bar
Loop #	Unload Modulus	Reload Modulus	
1	452	344	bar
2	694	537	bar
3	906	703	bar

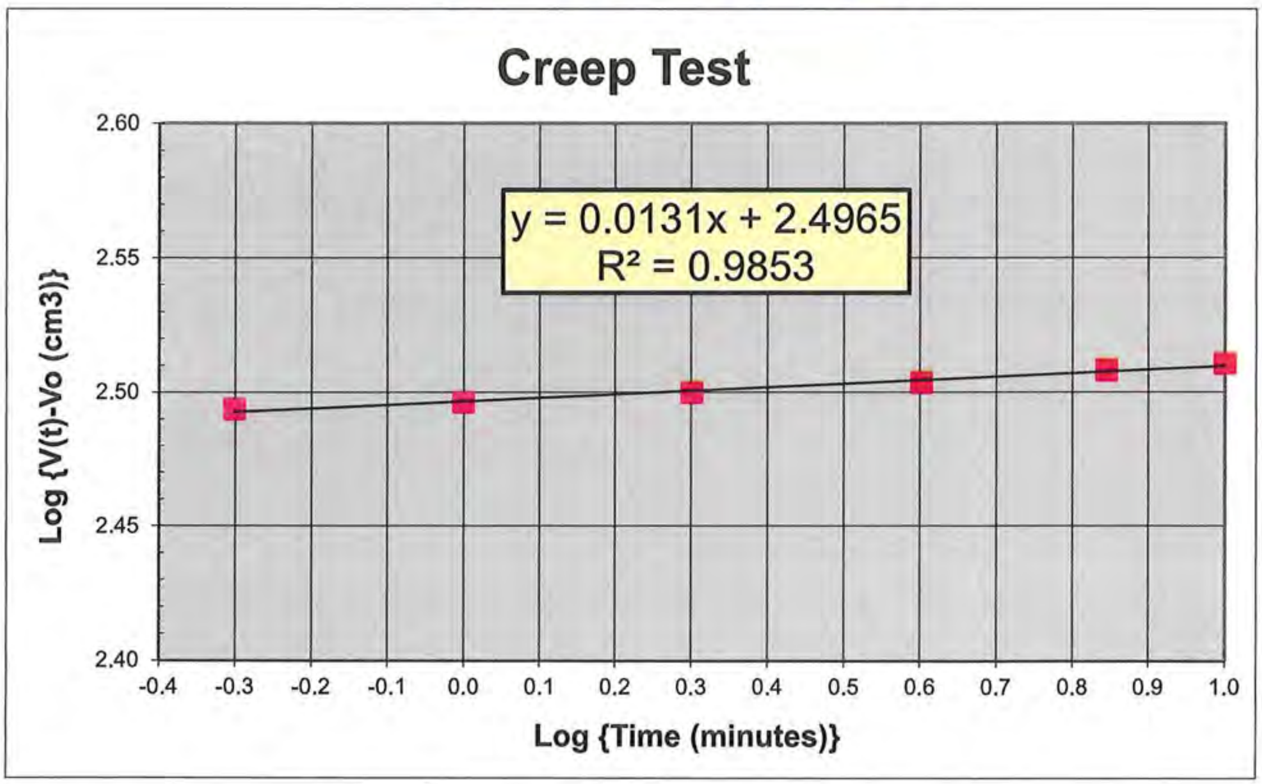


Pressuremeter Creep Test

Project: Wallops Island Northern Development
Sounding No.: P-2A
Test Depth: 35.0 feet
Holding Gauge Pressure = 2.78 bars
Corrected Pressure = 3.52 bars
Initial Probe Radius = 3.69 cm
Initial Probe Length = 50 cm
Initial Volume of Probe = 2139 cm^3
Probe Radius Contacting Borehole = 3.87 cm
Initial Borehole Volume, Vo = 2349 cm^3

Time (minutes)	Log (Time) (minutes)	Volume Increase (cm^3)	Total Probe Volume (cm^3)	$V(t)-V_0$ (cm^3)	Log $[V(t)-V_0]$ (cm^3)
0.5	-0.301	521.79	2660.60	311.54	2.494
1	0.000	523.73	2662.54	313.48	2.496
2	0.301	526.27	2665.08	316.02	2.500
4	0.602	529.04	2667.85	318.79	2.503
7	0.845	532.35	2671.16	322.10	2.508
10	1.000	534.21	2673.02	323.96	2.510

$E_0(t)/E_0(t=1\ min) = \{t/1\}^{-n}$
n = 0.0131

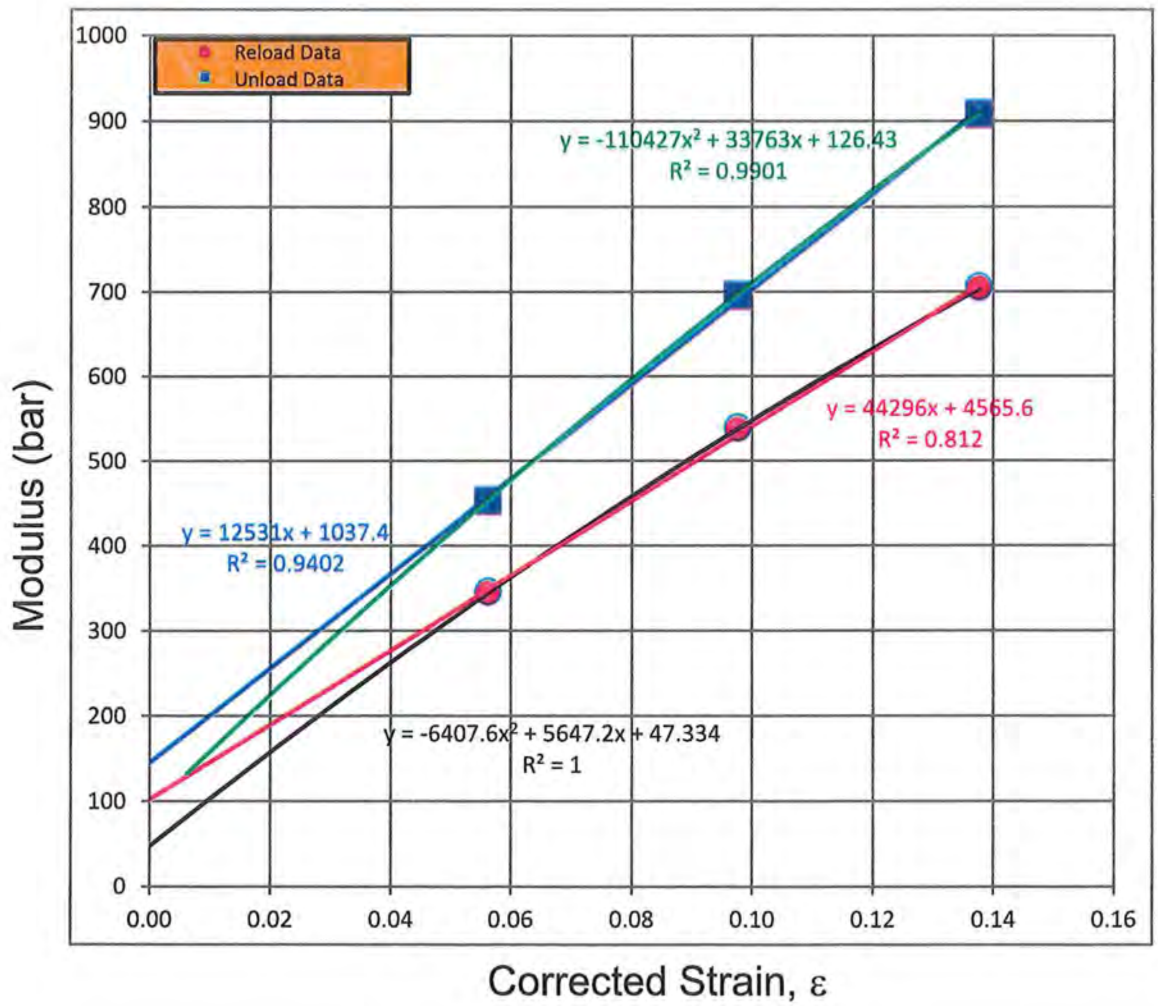


RELOAD/UNLOAD MODULUS ANALYSES

PROJECT:	Wallops Island Northern Development	BORING:	P-2A
LOCATION:	Wallops Island, Virginia	TEST #:	3
IN-SITU SOIL TESTING, L.C.		DEPTH:	35.0 ft
ENGINEER:	Roger A. Failmezger, P.E., F. ASCE, D GE	TEST DATE:	12/30/2020

Strain to contact borehole = 0.048

Average Strain	Corrected Strain	Reload Modulus	Average Strain	Corrected Strain	Unload Modulus
0.1042	0.0562	344	0.1041	0.0561	452
0.1456	0.0976	537	0.1455	0.0975	694
0.1856	0.1376	703	0.1855	0.1375	906



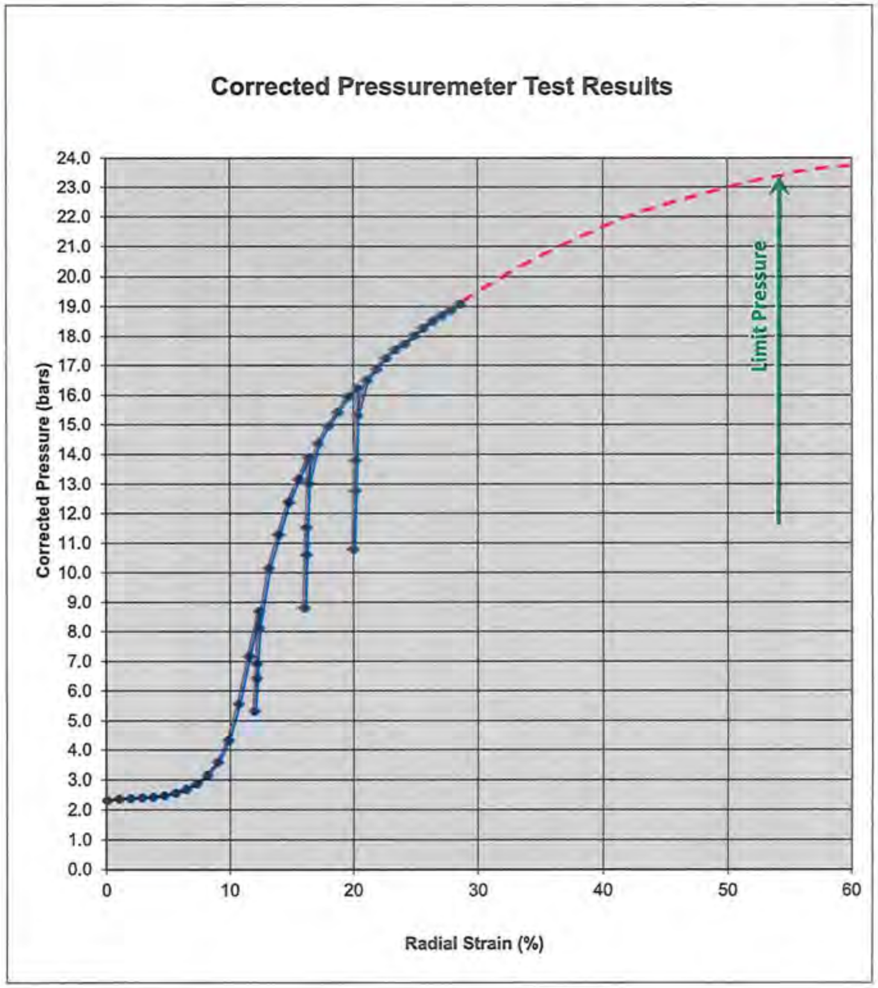
PRESSUREMETER TEST REPORT

PROJECT:	Wallops Island Northern Development	BORING:	P-2A
LOCATION:	Wallops Island, Virginia	TEST #:	4
IN-SITU SOIL TESTING, L.C.		DEPTH:	76.0 ft
ENGINEER:	Roger A. Failmezger, P.E., F. ASCE, D GE	TEST DATE:	December 30, 2020

Note: ***Depth*** refers to the distance from the ground surface to center of NX Probe.

Pressure Bar	Volume cm^3	$\Delta R/R_0$ %	Selected
2.32	0	0.00	
2.36	40	0.93	
2.38	80	1.85	
2.40	120	2.76	
2.43	160	3.67	
2.48	200	4.56	
2.56	240	5.45	
2.68	280	6.33	
2.87	319	7.21	
3.14	359	8.07	
3.58	399	8.93	E0a
4.32	438	9.77	
5.57	478	10.60	
7.17	517	11.42	E0b
8.69	556	12.24	E1a
6.43	547	12.05	
5.32	538	11.86	E1b
6.93	547	12.05	
8.13	556	12.25	E1c
10.14	595	13.05	
11.27	634	13.86	
12.36	673	14.66	
13.15	713	15.46	
13.89	752	16.26	E2a
10.61	744	16.09	
8.81	735	15.92	E2b
11.52	744	16.09	
13.01	753	16.27	E2c
14.36	792	17.06	
14.95	831	17.84	
15.42	871	18.63	
15.94	911	19.41	
16.23	951	20.18	E3a
12.77	942	20.02	
10.79	934	19.86	E3b
13.80	942	20.02	
15.31	951	20.20	E3c
16.50	990	20.96	
16.87	1030	21.72	
17.24	1070	22.48	
17.53	1110	23.24	
17.72	1150	23.99	
18.01	1189	24.74	
18.26	1229	25.49	
18.50	1269	26.23	
18.69	1309	26.96	
18.87	1349	27.70	
19.07	1389	28.42	

	Interpreted Pressuremeter Parameters		
	P_o	2.8	bar
	Limit Pressure Strain	53.4%	
	P_L	23.3	bar
	P_L^*	20.5	bar
	E_o	211	bar
	E_o/P_L^*	10.3	bar
Loop #	Unload Modulus	Reload Modulus	
1	1336	1092	bar
2	2284	1827	bar
3	2645	2122	bar

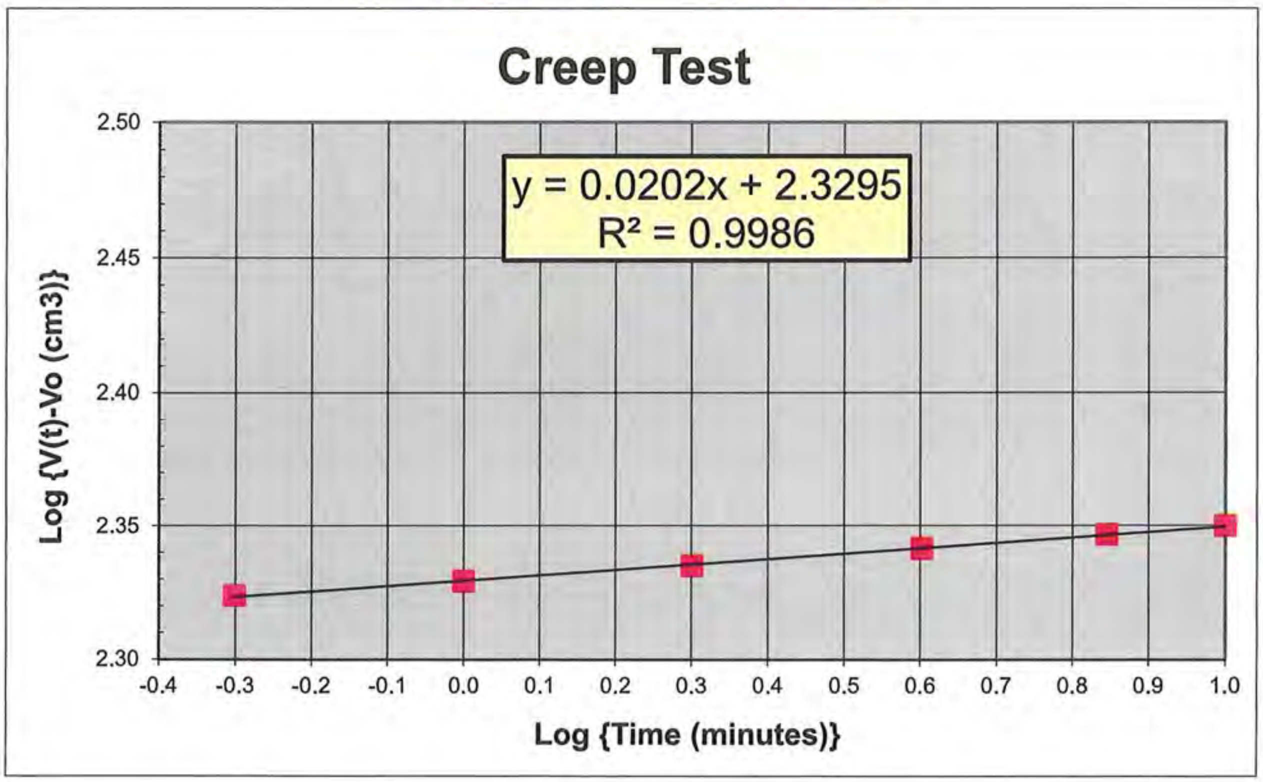


Pressuremeter Creep Test

Project: Wallops Island Northern Development
Sounding No.: P-2A
Test Depth: 76.0 feet
Holding Gauge Pressure = 8.19 bars
Corrected Pressure = 10.14 bars
Initial Probe Radius = 3.69 cm
Initial Probe Length = 50 cm
Initial Volume of Probe = 2139 cm^3
Probe Radius Contacting Borehole = 4.01 cm
Initial Borehole Volume, Vo = 2532 cm^3

Time (minutes)	Log (Time) (minutes)	Volume Increase (cm^3)	Total Probe Volume (cm^3)	$V(t)-V_0$ (cm^3)	Log $[V(t)-V_0]$ (cm^3)
0.5	-0.301	603.80	2742.61	210.81	2.324
1	0.000	606.46	2745.27	213.47	2.329
2	0.301	609.26	2748.07	216.27	2.335
4	0.602	612.51	2751.32	219.52	2.341
7	0.845	615.15	2753.96	222.16	2.347
10	1.000	616.85	2755.66	223.86	2.350

$E_0(t)/E_0(t=1\ min) = \{t/1\}^{-n}$
n = 0.0202

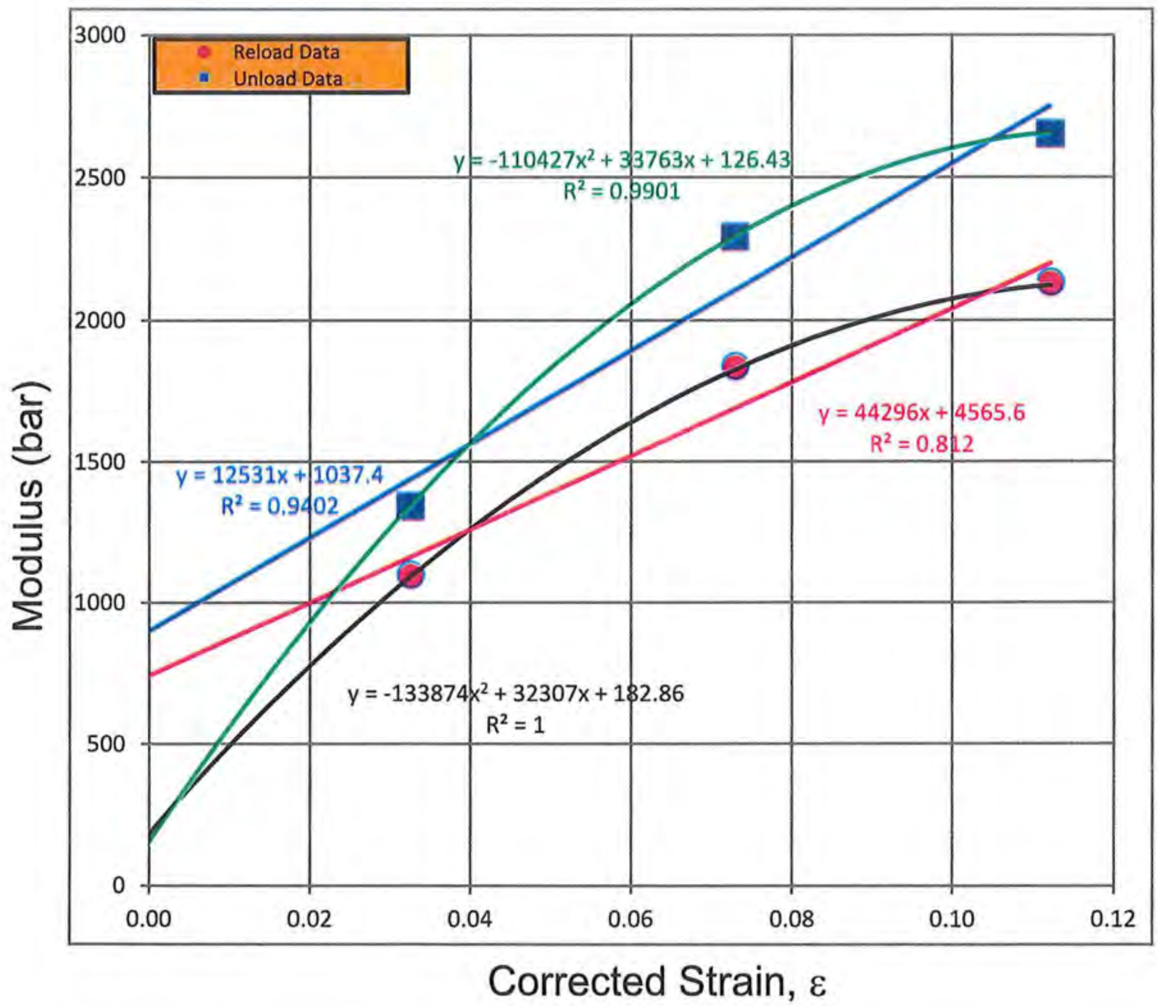


RELOAD/UNLOAD MODULUS ANALYSES

PROJECT: Wallops Island Northern Development		BORING:	P-2A
LOCATION: Wallops Island, Virginia		TEST #:	4
IN-SITU SOIL TESTING, L.C.		DEPTH:	76.0 ft
ENGINEER: Roger A. Failmezger, P.E., F. ASCE, D GE		TEST DATE:	12/30/2020

Strain to contact borehole = 0.088

Average Strain	Corrected Strain	Reload Modulus	Average Strain	Corrected Strain	Unload Modulus
0.1205	0.0325	1092	0.1205	0.0325	1336
0.1609	0.0729	1827	0.1609	0.0729	2284
0.2003	0.1123	2122	0.2002	0.1122	2645



HYNES

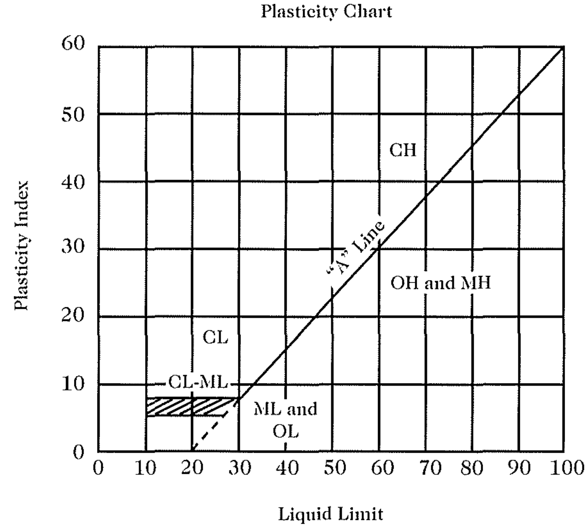
JOHN D. HYNES & ASSOCIATES, INC.

Geotechnical and Environmental Consultants
Monitoring Well Installation
Construction Inspection and Materials Testing

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions			*Group Symbols*	*Typical Names*	*Laboratory Classification Criteria*		
Coarse-grained soils (More than half of material is larger than No 200 sieve size)	Gravels (More than half of coarse fraction is larger than No 4 sieve size)	Clean gravels (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No 200 sieve size), coarse grained soils are classified as follows: Less than 5 percent: GW, GP, SW, SP; More than 12 percent: GM, GC, SM, SC; 5 to 12 percent: *Borderline cases requiring dual symbols*[b]	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			GP	Poorly graded gravels, gravel sand mixtures, little or no fines		Not meeting all graduation requirements for GW	
		Gravels with fines (Appreciable amount of fines)	GM[a] d / u	Silty gravels, gravel-sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are *border-line* cases requiring use of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7	
	Sands (More than half of coarse fraction is smaller than No 4 sieve size)	Clean sands (Little or no fines)	SW	Well-graded sands, gravelly sands,		$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			SP	Poorly graded sands, gravelly sands, little or no fines		Not meeting all graduation requirements for SW	
		Sands with fines (Appreciable amount of fines)	SM[a] d / u	Silty sands, sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are *border-line* cases requiring use of dual symbols.
			SC	Clayey sands, sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7	
Fine-grained soils (More than half material is smaller than No 200 sieve)	Silts and clays (Liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity			
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays			
			OL	Organic silts and organic silty clays of low plasticity			
	Silts and clays (Liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts			
			CH	Inorganic clays of high plasticity, fat clays			
			OH	Organic clays of medium to high plasticity, organic silts			
	Highly organic soils		Pt	Peat and other highly organic soils			

Plasticity Chart



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E-mail - jdhynes@aol.com

HYNES

FIELD CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

NON-COHESIVE SOILS
(Silt, Sand, Gravel and Combinations)

DENSITY

Very Loose	- 5 blows/ft. or less
Loose	- 6 to 10 blows/ft.
Medium Dense	- 11 to 30 blows/ft.
Dense	- 31 to 50 blows/ft.
Very Dense	- 51 blows/ft. or more

RELATIVE PROPORTIONS

Descriptive Term	Percent
Trace	1 - 10
Little	11 - 20
Some	21 - 35
And	36 - 50

PARTICLE SIZE IDENTIFICATION

Boulders	- 8 inch diameter or more
Cobbles	- 3 to 8 inch diameter
Gravel	- Coarse - 1 to 3 inch
	- Medium - 1/2 to 1 inch
	- Fine - 4.75 mm to 1/2 inch
Sand	- Coarse - 2.0 mm to 4.75 mm
	- Medium - 0.425 mm to 2.0 mm
	- Fine - 0.075 mm to 0.425 mm
Silt	- 0.075 mm to 0.002 mm

COHESIVE SOILS
(Clay, Silt and Combinations)

CONSISTENCY

Very Soft	- 3 blows/ft. or less
Soft	- 4 to 5 blows/ft.
Medium Stiff	- 6 to 10 blows/ft.
Stiff	- 11 to 15 blows/ft.
Very Stiff	- 16 to 30 blows/ft.
Hard	- 31 blows/ft. or more

PLASTICITY

Degree of Plasticity	Plasticity Index
None to Slight	0 - 4
Slight	5 - 7
Medium	8 - 22
High to Very High	over 22

Classification on logs are made by visual inspection of samples unless a sample has been subjected to laboratory classification testing.

Standard Penetration Test - Driving a 2.0 " O.D., 1-3/8" I.D., splitspoon sampler a distance of 1.0 foot into undisturbed soil with a 140 pound hammer free falling a distance of 30.0 inches. It is customary to drive the spoon 6 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and making the test are recorded for each 6 inches of penetration on the drill log (Example - 6/8/9). The standard penetration test value (N - value) can be obtained by adding the last two figures (i.e. 8 + 9 = 17 blows/ft.). (ASTM D-1586)

Strata Changes - In the column "Soil Descriptions," on the drill log, the horizontal lines represent strata changes. A solid line (—) represents an actually observed change, a dashed line (----) represents an estimated change.

Groundwater - Observations were made at the times indicated. Porosity of soil strata, weather conditions, site topography, etc. may cause changes in the water levels indicated on the logs.

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Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GBC GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org

ATTACHMENT 2: NOAA FISHERIES ESA MAPPER

Atlantic sturgeon
Adult
Migrating & Foraging
N/A

Acipenser oxyriynchus oxyriynchus
DPS: All DPSs
ESA Status: Threatened/Endangered

Time(s) of year:
01/01 to 12/31
N/A to N/A

Federal Register: 77 FR 5880 and 77 FR 5914
Recovery Plan: N/A

Notes: We expect adult Atlantic sturgeon to opportunistically forage year round as they migrate along the coast to and from their natal spawning grounds (Hilton et al. 2016, p. 8). They may aggregate in ocean and estuarine areas during certain times of year, and exhibit seasonal coastal movements in the spring and fall. We expect that they typically remain within the 50-meter depth contour (Erickson et al. 2011, p. 356, 360), but may be found out to the Exclusive Economic Zone (EEZ)(Stein et al. 2004, p. 174).

Sources: Hilton et al. 2016; Erickson et al. 2011; Stein et al. 2004

River Kilometers (if applicable):
to , (Hilton et al. 2016, p. 8)
to , (GARFO)

Feature ID: ANS_C50_ADU_MAF
Last Updated: 7/12/2017, 8:00 PM

Atlantic sturgeon
Subadult
Migrating & Foraging
N/A

Acipenser oxyriynchus oxyriynchus
DPS: All DPSs
ESA Status: Threatened/Endangered

Time(s) of year:
01/01 to 12/31
N/A to N/A

Federal Register: 77 FR 5880 and 77 FR 5914
Recovery Plan: N/A

Notes: We expect subadult Atlantic sturgeon to opportunistically forage year round as they migrate along the coast to and from their natal rivers (Hilton et al. 2016, p. 8). They may aggregate in ocean and estuarine areas during certain times of year, and exhibit seasonal coastal movements in the spring and fall. We expect that they typically remain within the 50-meter depth contour (Erickson et al. 2011, p. 356, 360), but may be found out to the Exclusive Economic Zone (EEZ)(Stein et al. 2004, p. 174).

Sources: Hilton et al. 2016; Erickson et al. 2011; Stein et al. 2004

River Kilometers (if applicable):
to , (Hilton et al. 2016, p. 8)
to , (GARFO)

Feature ID: ANS_C50_SUB_MAF
Last Updated: 7/12/2017, 8:00 PM

Green sea turtle
Adults and juveniles
Migrating & Foraging
Massachusetts (S of Cape Cod) through Virginia

Chelonia mydas
DPS: North Atlantic DPS
ESA Status: Threatened

Time(s) of year:
5/1 to 11/30
to

Federal Register: 81 FR 20057
Recovery Plan: NMFS & USFWS 1991

Notes: In general, juvenile and adult green sea turtles migrate north in the spring as water temperatures warm, arriving in mid-Atlantic waters in May. As the waters cool in the fall, the trend is reversed with most sea turtles leaving the area by the end of November. The waters south of Cape Cod were delineated based on Ecological Protection Units (EPUs), as defined by the Northeast Fisheries Science Center.

Sources: [Loggerhead] Shoop and Kenney 1992; [Green]USFWS 2015; [Kemp's ridley] NMFS and USFWS 2015

Feature ID: GRN_STS_AJV_MAF
Last Updated: 3/26/2017, 8:00 PM

Kemp's ridley sea turtle
Adults and juveniles
Migrating & Foraging
Massachusetts (S of Cape Cod) through Virginia

Lepidochelys kempii
DPS: N/A
ESA Status: Endangered

Time(s) of year:
5/1 to 11/30
to

Federal Register: 35 FR 18319
Recovery Plan: NMFS et al. 2011

Notes: In general, juvenile and adult Kemp’s ridley sea turtles migrate north in the spring as water temperatures warm, arriving in mid-Atlantic waters in May. As the waters cool in the fall, the trend is reversed with most sea turtles leaving the area by the end of November. The waters south of Cape Cod were delineated based on

Ecological Protection Units (EPUs), as defined by the Northeast Fisheries Science Center.

Sources: [Loggerhead] Shoop and Kenney 1992; [Green]USFWS 2015; [Kemp's ridley] NMFS and USFWS 2015

Feature ID: KMP_STS_AJV_MAF
Last Updated: 3/26/2017, 8:00 PM

Leatherback sea turtle
Adults and juveniles
Migrating & Foraging
Massachusetts (S of Cape Cod) through Virginia

Dermochelys coriacea
DPS: N/A
ESA Status: Endangered

Time(s) of year:
5/1 to 11/30
to

Federal Register: 35 FR 849
Recovery Plan: NMFS & USFWS 1992

Notes: In general, juvenile and adult leatherback sea turtles migrate north in the spring as water temperatures warm, arriving in mid-Atlantic waters in May. As the waters cool in the fall, the trend is reversed with most sea turtles leaving the area by the end of November. The waters south of Cape Cod were delineated based on Ecological Protection Units (EPUs), as defined by the Northeast Fisheries Science Center.

Sources: [Loggerhead] Shoop and Kenney 1992; [Green]USFWS 2015; [Kemp's ridley] NMFS and USFWS 2015

Feature ID: LTR_STS_AJV_MAF
Last Updated: 3/26/2017, 8:00 PM

Loggerhead sea turtle
Adults and juveniles
Migrating & Foraging
Massachusetts (S of Cape Cod) through Virginia

Caretta caretta
DPS: Northwest Atlantic DPS
ESA Status: Threatened

Time(s) of year:
5/1 to 11/30
to

Federal Register: 76 FR 58868
Recovery Plan: NMFS & USFWS 2008

Notes: In general, juvenile and adult loggerhead sea turtles migrate north in the spring as water temperatures warm, arriving in mid-Atlantic waters in May. As the waters cool in the fall, the trend is reversed with most sea turtles leaving the area by the end of November. The waters south of Cape Cod were delineated based on Ecological Protection Units (EPUs), as defined by the Northeast Fisheries Science Center.

Sources: [Loggerhead] Shoop and Kenney 1992; [Green]USFWS 2015; [Kemp's ridley] NMFS and USFWS 2015

Feature ID: LOG_STS_AJV_MAF
Last Updated: 3/26/2017, 8:00 PM

ESA Section 7 Mapper

NOAA Fisheries Greater Atlantic Region

From:	Miller, Shari A. (WFF-2500) <shari.a.miller@nasa.gov>
Sent:	Wednesday, November 10, 2021 12:11 PM
To:	jennifer.anderson@noaa.gov
Cc:	Nate Overby; David O'Brien (david.l.obrien@noaa.gov); Brian Hopper (Brian.D.Hopper@noaa.gov); brian.c.denson@usace.army.mil; Finio, Alan (MARAD); Meyer, T J (WFF-2500); Finch, Kimberly (GSFC-2500); Levine, Lori M. (GSFC-2500)
Subject:	Project Review Request, Wallops Island Northern Development, NASA WFF
Attachments:	NASA WFF_NorthDevelop - NOAA_T&E Consult Ltr_111021.pdf

Dear Ms. Anderson:

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) proposes to construct a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel. NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Endangered Species Act (ESA) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfil their requirements.

Based on the analysis in the attached assessment, all effects of the Proposed Action would be insignificant and/or discountable, we have determined that the Wallops Island Northern Development Project may affect but is not likely to adversely affect any listed species or critical habitat under NOAA Fisheries' jurisdiction. We certify that we have used the best scientific and commercial data available to complete this analysis. We request your concurrence with this determination.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Thank you.

Shari A. Miller
Center NEPA Manager &
Natural Resources Manager
NASA GSFC Wallops Flight Facility
Wallops Island, VA 23337
(757) 824-2327
Shari.A.Miller@nasa.gov
https://code200-external.gsfc.nasa.gov/250-wff/

"Remember there's no such thing as a small act of kindness. Every act creates a ripple with no logical end." —Scott Adams

National Aeronautics and Space Administration

Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337

Reply to Attn of: 250.W

November 10, 2021

Ms. Jennifer Anderson
Protected Resources Division
Greater Atlantic Regional Fisheries Office
NOAA Fisheries Service
55 Great Republic Drive
Gloucester, Massachusetts 01930

Re: Project Review Request, Wallops Island Northern Development, NASA Wallops Flight Facility, Accomack County, Virginia

Dear Ms. Anderson:

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) proposes to construct a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel (**Figures 1 and 2**). NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Endangered Species Act (ESA) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfil their requirements.

NASA is preparing an Environmental Assessment (EA) in compliance with NEPA to analyze the potential effects of the proposed action on the environment. The EA will be tiered from the May 2019 *NASA WFF Site-Wide Programmatic Environmental Impact Statement* (PEIS), in which NASA evaluated the environmental consequences of constructing and operating new facilities and infrastructure at WFF.

The purpose of this letter is to provide information about the proposed project and to request your concurrence with our determinations regarding potential effects on federally listed threatened and endangered species under National Oceanic and Atmospheric Administration (NOAA) Fisheries jurisdiction in the action area.

Background

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 2019a). The M-95 Marine Highway Corridor 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 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 2019b).

VCSFA 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 STEM 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 launches to orbital trajectories. This led to the establishment of the Mid-Atlantic Regional Spaceport (MARS) which is owned and operated by VCSFA.

Development of a port and operations area to support the activities of NASA, WFF tenants, and MARS at the north end of Wallops Island was evaluated at a programmatic level of detail in the 2019 *Final Site-wide PEIS* (NASA 2019). NASA has several long-term tenants and customers that use the WFF research airport and Wallops Island launch range, its facilities, and airspace.

Description of the Proposed Action

Under the Proposed Action, the MARS Port, including a 1,305-ft fixed pier and turning basin, would be constructed adjacent to the UAS airstrip located at the north end of Wallops Island (**Figures 1 and 2**). 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 intermodal facility as part of the MARAD M-95 Marine Highway Corridor. Upland infrastructure (new facilities and improvements to the existing access road, airstrip, and utilities) would likewise be constructed/installed as part of the Proposed Action. Access road improvements would include widening of an existing culvert. Although shown for completeness in **Figure 2**, upland activities that would not affect species under NOAA Fisheries jurisdiction are not discussed further.

The Proposed Action would also include the dredging of a new and existing channel to enhance the vessel approach to the pier (**Figure 3**). The vessel approach channel, which interfaces with two Federal waterways, the Chincoteague Inlet Channel and the Chincoteague Inlet to Bogues Bay connecting waters, would initially be used by a variety of shallow-draft, manned and unmanned vessels. Ultimately, the proposed channel would have a length of approximately 12,800 ft, a width of 100 ft, and a final depth of 12 ft below mean lower low water (MLLW). Components of the Proposed Action are further described below.

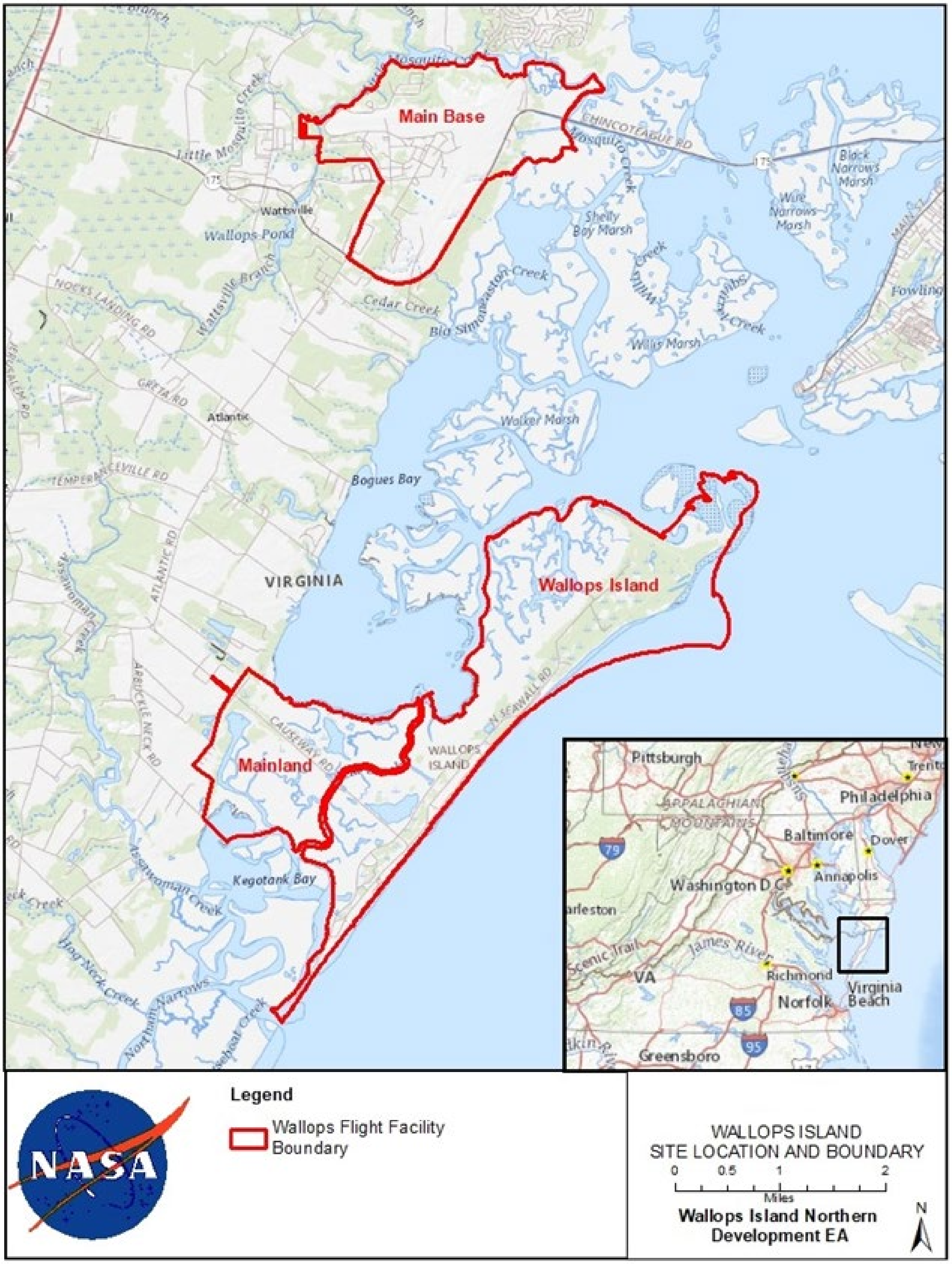

Figure 1. NASA WFF Location

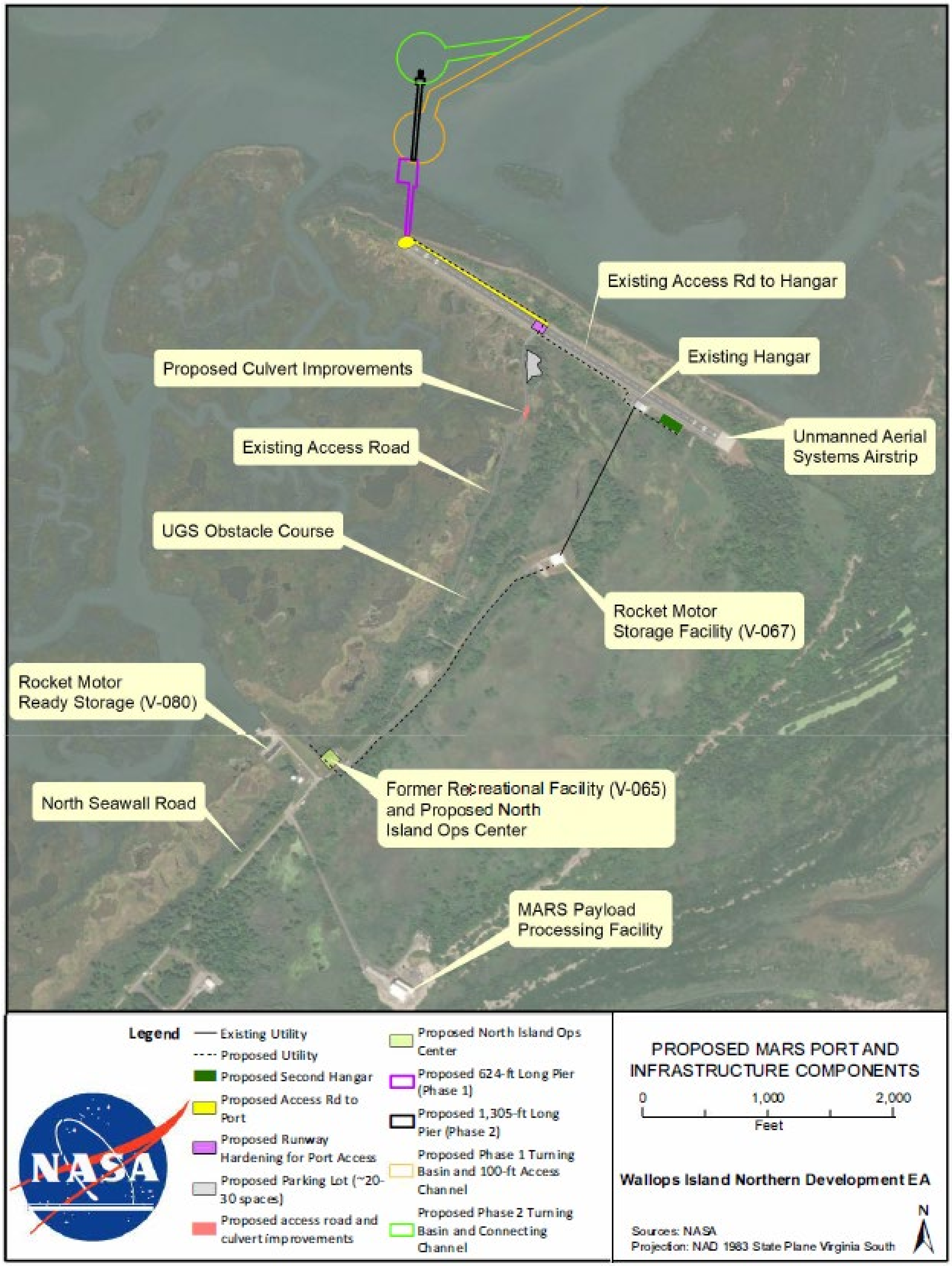

Figure 2. Proposed MARS Port and Infrastructure Components

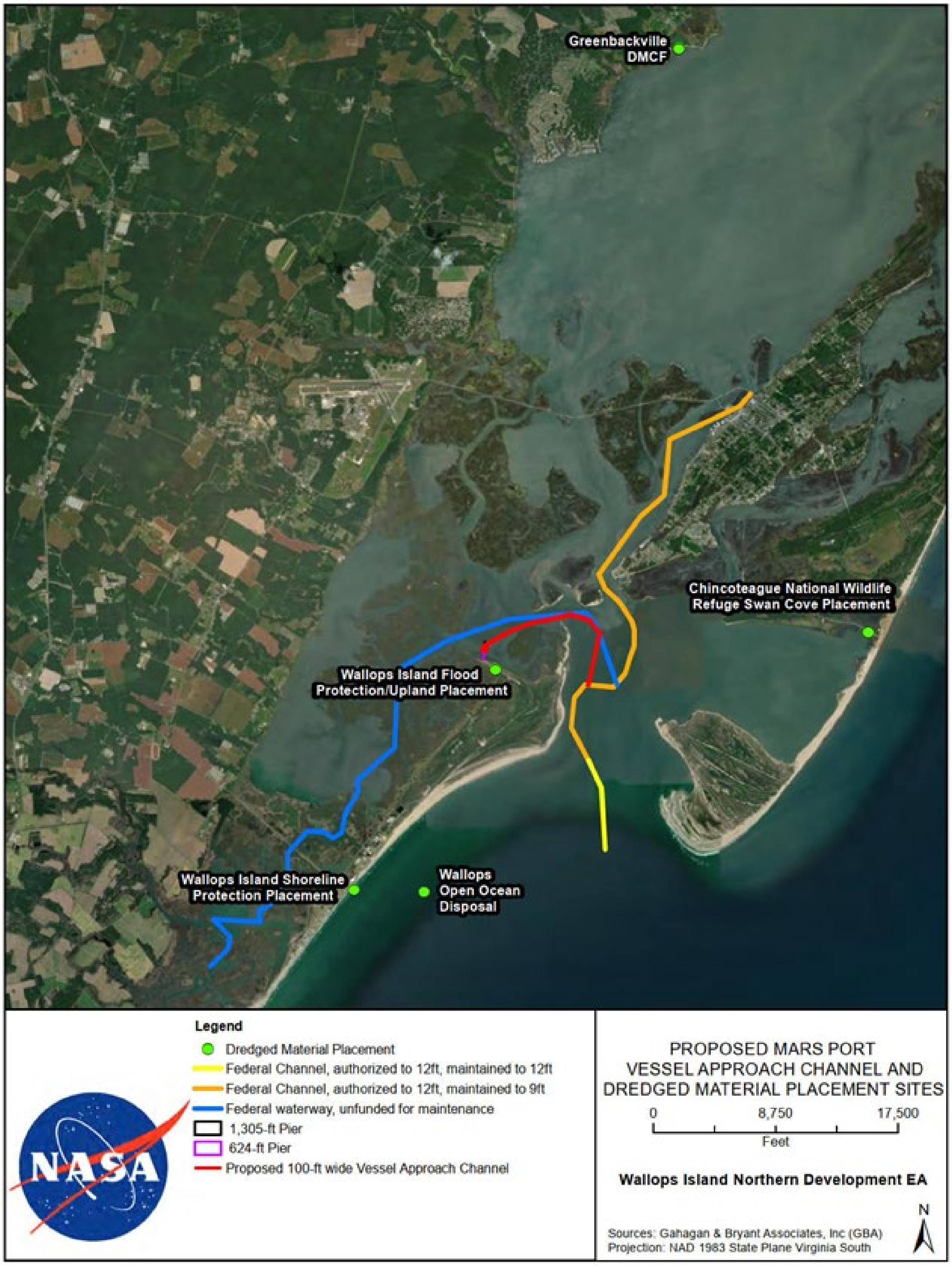

Figure 3. Proposed MARS Port Vessel Approach Channel and Dredged Material Placement Sites

Proposed Action In-Water Components

The MARS Port, including a 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. The MARS Port would provide a port and operations area along with associated capabilities for MARS, NASA WFF, and other customers. The MARS Port would also serve as a new part of the MARAD M-95 Marine Highway Corridor.

The Proposed Action would also include the dredging of an existing channel for enhanced vessel approach purposes. The vessel approach channel, which would interface with both the Chincoteague Inlet Federal Channel and the Bogues Bay connecting waterways, would be used by a variety of manned and unmanned vessels. It would be approximately 12,800 ft long, 100 ft wide, and would have a final depth of 12 ft below MLLW.

Construction of the Proposed Action would be carried out in three phases:

- **Phase 1** would be construction of a 624-ft fixed pier, a 200-ft-radius turning basin 9 ft deep below MLLW and dredging of the vessel approach channel to a final depth of 5 ft to 9 ft below MLLW (red outline in **Figure 4**). Additionally, a 130-ft long segment of the existing paved UAS Airstrip access road would be widened from 15 ft to 30 ft in conjunction with the widening of the culvert over which the road crosses a headwater drainage channel to Cow Gut.
- **Phase 2** would be construction of a 676-ft extension of the fixed pier to a total length of 1,305 ft and dredging of a 200-ft-radius turning basin (located at the end of the pier extension; shaded pink on **Figure 4**) to a final depth of 9 ft below MLLW.
- **Phase 3** of construction would be additional dredging of the turning basin and vessel approach channel to a final depth of 12 ft below MLLW, specifically the portion of the channel from the Phase 2 turning basin to where it meets the Chincoteague Inlet Federal Channel (shaded blue on **Figure 4**).

The portion of the channel shown in pink on **Figure 4**, which connects the vessel approach channel to the Phase 2 turning basin, is naturally deeper than 9 feet 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 2022 and being completed by 2024, with subsequent phases occurring approximately 1 to 2 years after completion of the prior phase. Additional information about the proposed piers and other port components is provided in Chapter 2 of the Draft EA.

A variety of shallow-draft (2- to 4-ft), manned and unmanned vessels would be serviced by the port. The major navigational service would be a tug and barge configuration of an approximately 150-ft by 40-ft deck barge propelled by a tugboat requiring approximately 8 ft of draft. The vessel approach channel would intersect with the Chincoteague Inlet Federal Channel and the Bogues Bay connecting waterways (**Figure 3**). The proposed width of the approach channel, approximately 100 ft, is consistent with the dimensions of the Federal Channel. Estimated dredging volumes for the vessel approach channel and turning basin are provided in **Table 1**.

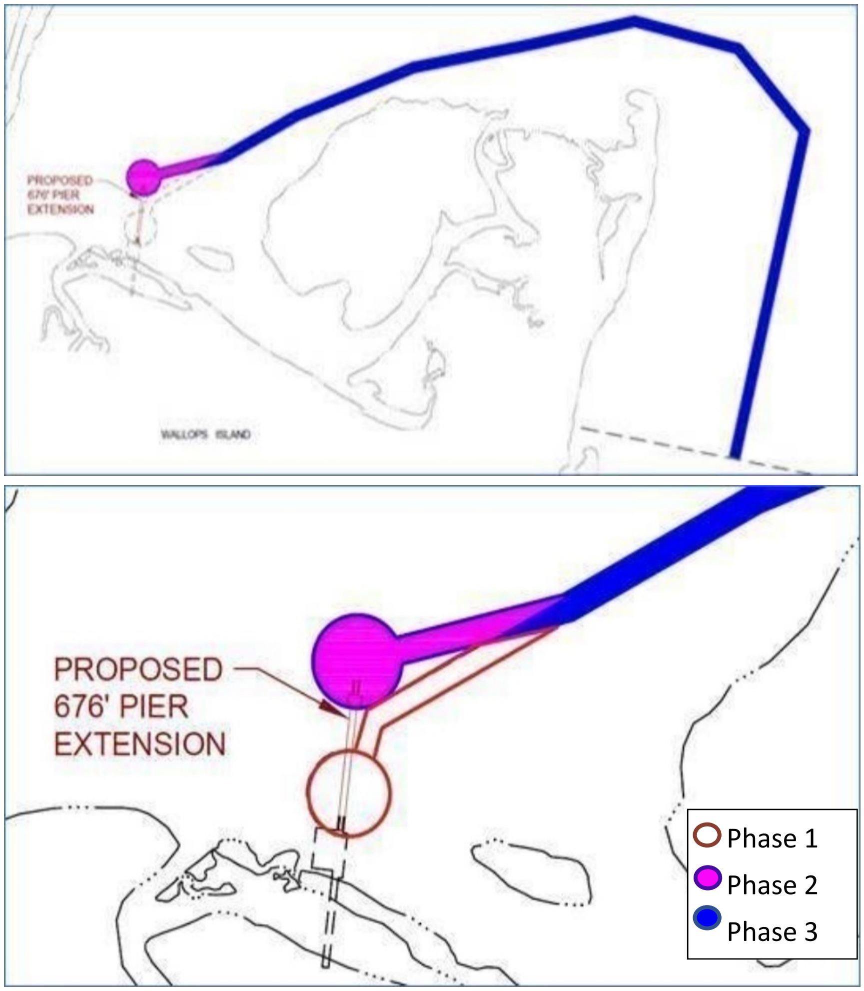

Figure 4. Diagram of Proposed Phased Construction

Table 1.	**Channel Dimensions and Estimated Dredging Volumes**		
	Phase 1	**Phase 2**	**Phase 3**
Channel area	9 ft deep below MLLW	9 ft deep below MLLW	12 ft deep below MLLW
Channel length	12,800 ft	11,800 ft	11,800 ft
Channel dredging volume	15,100 yd^3	0	34,600 yd^3
Turning basin dredging volume	40,500 yd^3	800 yd^3	3,200 yd^3
Total volume per phase	55,600 yd^3	800 yd^3	37,800 yd^3
		Total Volume (Phases 1–3):	**94,200 yd^3**

yd^3 = cubic yards

Five potential sites for the placement of dredged material are summarized in **Table 2** and shown on **Figure 3**. Currently, it is estimated that between 56,000 CY and 57,000 CY of material would be dredged during the initial dredging event. VCSFA intends to utilize Option 1, the Wallops Open Ocean Dredge Material Placement Area, as the initial dredge material placement site. When compared to Options 2 through 5, 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. The Open Ocean site is also the fastest path towards construction as it is already permitted by the USACE and has capacity for the proposed initial dredge material. While the Greenbackville DMCF (Option 3) is also already permitted by the USACE, it is not anticipated to have available capacity to handle the initial projected volume of material due to its expected use by USACE. Lastly, the dredged material is expected to be of similar physical and chemical characteristics as the material currently dredged from the Chincoteague Channel by the USACE. Dredged material placed within the Wallops Island nearshore zone is required to have the same physical characteristics (90%+ sand) as the natural bottom 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 compromised of approximately 95% sand and, therefore, would be suitable for the Open Ocean site.

For future maintenance dredging events, the Project may use Option 2, Wallops Island Flood Protection/Upland Placement. Keeping this as an option allows for future beneficial re-use of the dredge material on Wallops Island to provide resiliency to the MARS UAS Airfield. The cost of this option is higher as it would require additional studies, design, and construction to contain and shape the pumped discharge. Option 2 may also have impacts to the wetlands north of the UAS Airfield. Further analysis would be required for this impact and depending on the results, thin layer deposition or the use of geotubes could be required to hold the material. Lastly, the UAS Airfield is currently not permitted for material placement; the permitting process would require a longer timeframe than Option 1. If selected for placement during future maintenance dredging events, designs, impact analysis, and permitting would be required and would be performed at that time.

Table 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	Description
1	Wallops Open Ocean Dredge Material Placement Area	Open water placement site, closer than Lewis Creek or Norfolk Ocean disposal sites	6.1 mi	--	4.4 mi	--	This area is located just offshore of Wallops Island with a transportation distance of the dredged material of approximately 4 nautical mi. Open water placement options typically present the lowest cost dredging option and allows 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
2	Wallops Island Flood Protection/ Upland Placement	Reuse of material for flood mitigation through upland placement at site identified by NASA	--	2,800 ft	--	12,040 ft	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 crossing 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.

Table 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	Description
3	Greenbackville Dredged Material Containment Facility (DMCF)	Upland DMCF run by USACE, requires both navigation of Chincoteague Channel and pumping on location	11.3 mi	--	9.5 mi	650 ft	The third dredged material placement option identified is the use of the upland Dredged Material Containment Facility (DMCF) owned and managed by the USACE. The USACE places material dredged from the upper reaches of the Chincoteague Channel into this DMCF. This option, which would require the USACE to first verify capacity and permit use of this site, would utilize a mechanical dredge to load the dredged material removed from the approach channel into barges. These barges would then be towed approximately 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. However, according to USACE, this site has limited capacity for material and may not be suitable.
4	Wallops Island Shoreline Protection Placement	Reuse of material for shoreline protection and beach repair	7.5 mi	--	6 mi	--	This option would involve the beneficial reuse of clean, compatible sand from the dredged material to repair and protect areas of the shoreline within the Launch Range area on Wallops Island. If dredged material is 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 such as hurricanes and Nor'easters. 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 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.

Table 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	Description
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)	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 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 under sized 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. Once pumped, USFWS will assume responsibility for sediment placement and is in the process of securing appropriate permits.

[1] Sail distance = 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 (statute miles)
[2] Pipe distance = the length of pipe required to reach the placement site from the centroid of dredging or from the anchorage for a vessel loaded with dredged material
DMCF = Dredged Material Containment Facility

Summary of Proposed Action Construction Activities

Construction of the Proposed Action would involve: (1) construction of the pier components that would make up the MARS Port, (2) dredging of the vessel approach channel, turning basin, and placement of dredged material, and (3) construction or improvement of the proposed onshore facilities and infrastructure.

The estimated timeframe for construction of the Proposed Action would have Phase 1 beginning in 2022 and being completed by 2024, with subsequent phases occurring approximately 1 to 2 years after completion of the prior phase. 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). With two crews (10 persons each), working 5 days per week (10-hour days), construction of the 624-ft long pier under Phase 1 would take approximately 12 months to complete and construction of the 676-ft long pier extension under Phase 2 (for a total pier length 1,305 ft) would take approximately 9.5 months to complete.

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, tugboat, vibratory pile hammer, diesel impact hammer, concrete truck, concrete pump truck, concrete vibrator, generator, welding machines, cutting torches, and various small tools.

Summary of Proposed Action Operational Activities

VCFSA/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 fencing around the Revolutionary War Earthworks. During summer months, a mosquito fogging service truck sprays the airfield once every 2 weeks. The pier structure would also require quarterly structural inspections.

Potential usage of the MARS Port facility during its operation is provided in **Table 3**.

Table 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

Table 3. Potential MARS Port Operations/Facility Usage				
Potential Facility Usage	**Vessel Type**	**Quantity Assumptions**	**Total Barge / Vessel Trips**	**Phase Associated with Usage**
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 push boat	1 per 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
Total Barge / Vessel Trips			**99**	

Description of the Action Area

The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR 402.02). For this project, the action area includes the north end of Wallops Island surrounding the UAS Airstrip including the surrounding waters from Chincoteague Inlet to the east and north to Bogues Bay to the west – the offshore areas potentially affected by pier construction, dredging of channels and turning basins, placement of dredged sediment, and vessels transiting between the proposed pier and the existing Chincoteague Inlet Federal Channel.

The offshore habitats within the action area include tidal marsh communities and the estuarine surface waters of Chincoteague Inlet, Bogues Bay, Ballast Narrows, and other waterways. The nearest beds of submerged aquatic vegetation are approximately 3 miles north of the project area. Waters in the project area contain public and private harvesting areas for shellfish (oysters and clams).

NMFS Listed Species (and Critical Habitat) in the Action Area

The federally listed species and life stages with the potential to occur in the action area were identified through a query of the NOAA Fisheries Section 7 online mapping application (the ESA Section 7 Mapper) as having the potential to occur in the action area. The information from the ESA Section 7 Mapper is included in **Attachment 1**. **Table 4** summarizes the information for each species regarding the life stages that could be present in the area, the time of year when they may be present, and the types of behaviors they are expected to be engaged in when present.

Table 4. Federally Listed Species Under NOAA Fisheries Jurisdiction Potentially Occurring in the Action Area

Common Name	Scientific Name	Listing Status	DPS	Life Stage	Behavior	Time of Year	Recovery Plan
Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*	Threatened/ Endangered	All	Adult and subadult	Migrating and foraging	1 Jan – 31 Dec	N/A
Leatherback sea turtle	*Dermochelys coriacea*	Endangered	N/A	Adult and juveniles	Migrating and foraging	1 May – 30 Nov	NMFS & USFWS 1992
Loggerhead sea turtle	*Caretta caretta*	Threatened	Northwest Atlantic	Adult and juveniles	Migrating and foraging	1 May – 30 Nov	NMFS & USFWS 2008
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered	N/A	Adult and juveniles	Migrating and foraging	1 May – 30 Nov	NMFS et al. 2011
Green sea turtle	*Chelonia mydas*	Threatened	North Atlantic	Adult and juveniles	Migrating and foraging	1 May – 30 Nov	NMFS & USFWS 1991

Notes:
DPS = Distinct population segment
N/A = Not applicable
Source: NOAA Fisheries (2020)

One listed fish species (Atlantic sturgeon) and four listed sea turtle species (leatherback, loggerhead, Kemp's ridley, and green) were identified by the ESA Section 7 Mapper as potentially occurring in the action area. No critical habitat for these species has been designated in the area. Information regarding the potential for occurrence of each species in the action area or the vicinity of WFF is provided below. Although not identified by the Section 7 Mapper as a species potentially occurring in the action area, the giant manta ray has been observed off the coast of Assateague Island (Swann 2018) and has been observed in estuarine waters, oceanic inlets, and bays. However, it is rare, solitary, and migratory, and the action area does not provide optimal habitat or food sources. Therefore, the giant manta ray is extremely unlikely to occur in the area and is not discussed further.

Fish

Atlantic Sturgeon

The Atlantic sturgeon is anadromous and estuarine-dependent. 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 action area, so it is expected that any individuals present would be opportunistically foraging during migration. 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.

Sea Turtles

Leatherback Sea Turtle

The leatherback sea turtle mainly forages in the ocean but also in coastal waters in search of its soft-bodied prey, predominantly jellyfish. It is the most migratory and wide-ranging of all sea turtles. Although the leatherback is known to occur in the waters offshore of Accomack County, it has never been sighted swimming or nesting on the beaches at WFF (NASA 2019). Given the minimal habitat for the leatherback or its jellyfish prey in the action area, its potential to be present is likely to be limited to occasional transient adults or juveniles passing through the area from May through November.

Loggerhead Sea Turtle

The loggerhead sea turtle spends the majority of its life in the open ocean or nearshore coastal areas, foraging for mainly invertebrate prey such as crabs, whelks, and conch. It nests on beaches and occasionally on estuarine shorelines. NOAA Fisheries has divided the loggerhead population into nine DPSs, four that are threatened and five that are endangered. The population near WFF belongs to the federally threatened Northwest Atlantic DPS. NOAA Fisheries has designated 38 critical habitat areas within marine areas occupied by the northwest Atlantic DPS, and USFWS has identified 88 beaches from North Carolina to Mississippi as critical nesting habitat. None of these areas are in the vicinity of WFF. However, loggerhead nests have been observed on Wallops Island beaches as recently as 2016 (NASA 2019). The proposed action would not occur on or affect beaches potentially providing nesting habitat for the loggerhead sea turtle. Its potential to be present in the action area is likely to be limited to occasional transient adults or juveniles foraging in or migrating through the area from May through November.

Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle ranges as far north as Maine. It is found in oceanic and estuarine areas that typically contain muddy or sandy bottoms, where it feeds on crabs as well as mollusks, fish, and jellyfish. The Kemp's ridley nests on beaches from May to July, with 95% of the worldwide nesting of the Kemp's ridley occurring in the Mexican state of Tamaulipas. Occasional nests have been documented on the east coast of the United States, including the southeast coast of Virginia. The Kemp's ridley has never been directly observed at WFF. The species may occur offshore in relatively shallow waters (less than 160 ft [50 m]) in areas where habitat exists for prey species (NASA 2019). Given the lack of documented occurrences at WFF, its potential to occur in the action area is likely to be limited to occasional transient adults or juveniles foraging in or migrating through the area from May through November.

Green Sea Turtle

The green sea turtle is unique among marine turtles in that it feeds exclusively on plants, primarily sea grasses and algae. In the U.S., the green sea turtle primarily nests in June and July along the east coast of Florida, with lower occurrences of nesting northward to North Carolina. Green sea turtles use open ocean convergence zones and coastal areas for benthic feeding on sea grasses and algae. The green sea turtle has been directly observed in waters off WFF (NASA 2019). They are likely to inhabit the waters off WFF during the warmer months when sea grasses and algae are plentiful; however, nesting habitat occurs farther south. Given the minimal habitat for the green sea turtle in the action area, including the lack of seagrass beds, its potential to be present is likely to be limited to occasional transient adults or juveniles foraging in or migrating through the area from May through November.

Effects Determination

As shown in **Table 4**, each of the five federally listed marine species potentially occurring in the action area would be expected, if present, to be engaged in foraging and/or migrating through the area. However, as indicated by their life history characteristics and records for the WFF area, the potential for occurrence of any of these species in the action area is minimal and is expected to be limited to the occasional transient passage of individuals through the area during migration or while foraging. Only the Atlantic sturgeon is potentially present in the action area throughout the full year. Sea turtles are potentially present in the area only within a 7-month period (May through November), further limiting their potential for exposure and effects. The potential for effects on these species is discussed below.

Atlantic Sturgeon

It is possible, though unlikely, that Atlantic sturgeon could be affected by the Proposed Action. Recent studies 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., mouths of Chesapeake and Delaware Bays) 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 these activities were conducted, with the likelihood of encountering a sturgeon greatest during fall and early spring, which are times of peak migration (NASA 2019). Construction and operations activities under the Proposed Action potentially could affect Atlantic sturgeon if present in the action area as a result of pile-driving noise, vessel noise (including dredging noise), and turbidity due to sediment disturbance during construction and dredging.

Construction activities would not be anticipated to substantively affect migration or foraging behaviors of the Atlantic sturgeon. The inadvertent destruction or displacement of benthic species would be localized and would not substantially affect the quantity of benthic prey available in waters near the action area. The area of marsh and open water bottom beneath the pier would be approximately 1 acre (ac) in Phase 1 and 1.5 ac in Phase 3. The areas to be dredged, including turning basins and channels, would be approximately 34 ac in Phase 1, 4 ac in Phase 2, and 33 ac in Phase 3. Thus, the maximum area to be dredged through all phases of the Proposed Action would be approximately 71 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.

Pile-Driving Noise

Sturgeon and other special status marine species occurring in the inshore waters of the Proposed Action area potentially could be affected by underwater noise caused by pier construction. The principal source of construction noise would be pile installation. Construction of the 624-foot pier under Phase 1 would take approximately 12 months to complete, and construction of the 676-foot pier extension under Phase 2 (for a total pier length of 1,305 feet) would take approximately 9.5 months, with about 1 to 2 years between phases. 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. A bubble curtain could be used for noise attenuation. A slow start technique would be used to allow mobile species to move away from the area.

The NOAA Fisheries Greater Atlantic Regional Fisheries Office (GARFO) developed a spreadsheet Acoustics Tool (GARFO 2020) for analyzing the effects of pile driving in inshore waters on ESA-listed 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 action area. Based on the characteristics of the proposed pile driving, information for a proxy project from the GARFO SAF spreadsheet is shown in **Table 5**. The estimated noise levels at the source associated with pile driving for the Proposed Action, based on measurements for a proxy project (at a distance of 10 meters), are presented in **Table 6** (GARFO 2020).

Table 5. Proxy Project for Estimating Underwater Noise					
Project location	**Water depth (m)**	**Pile size (in)**	**Pile type**	**Hammer type**	**Attenuation rate (dB/10 m)**
Not available	5	24	concrete	impact	5

m = meters; in = inches; dB = decibels
Source: GARFO (2020)

Table 6. Proxy-Based Estimates for Underwater Noise Level at the Source				
Pile type	**Hammer type**	**Estimated SPL_{peak} (dB re 1 Pa)**	**Estimated SEL_{cum} (dB re 1 µPa^{2}s)**	**Estimated SPL_{rms} (dB re 1 µPa)**
24-in concrete	impact	185	170	160

dB re 1 µPa = sound exposure level in decibels relative to 1 microPascal; dB re 1 µPa^{2}s = 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: GARFO (2020)

The GARFO SAF model was used to estimate the distances from pile-driving activities at which thresholds for noise-related effects would be exceeded. Effects can range from behavioral changes/disturbance to physical injury. Because sound (noise) consists of variations in pressure, the unit for measuring sound is referenced to a unit of pressure, the Pascal (Pa). A decibel (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 sound exposure levels (SELs) also are expressed in decibels.

The thresholds for effects vary among types of organisms. Effect thresholds have been identified by NOAA Fisheries for fish (including sturgeon), sea turtles, and marine mammals. For sturgeon, the estimated distances at which pile-driving noise would equal or exceed injury or behavioral threshold levels are shown in **Table 7**.

Table 7. Estimated Distances to Sturgeon Injury and Behavioral Thresholds				
Pile type	**Hammer type**	**Distance to injury threshold (SPL_{peak} = 206 dB re 1 µPa)**	**Distance to injury threshold (SEL_{cum} = 187 dB re 1 µPa^{2}s)**	**Distance to behavioral threshold (SPL_{rms} = 150 dB re 1 µPa)**
24-in concrete	impact	NA	30 m	50 m

m = meters; in = inches; dB re 1 µPa = sound exposure level in decibels relative to 1 microPascal; dB re 1 µPa^{2}s = 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; NA = not applicable because source level is less than or equal to threshold level
Source: GARFO (2020)

The peak exposure criterion (SPL_{peak} = 206 dB re 1 Pa) for sturgeon is related to the energy received from a single pile strike. The potential for injury also exists from multiple exposures to noise over a period of time, which is accounted for by the SEL_{cum} threshold (SEL_{cum} = 187 dB re 1 μPa^{2}s). The SEL_{cum} is not an instantaneous maximum noise level but is a measure of the accumulated energy over a specific period of time (e.g., the period of time it takes to install a pile). The farther away a fish is from the pile being driven, the more strikes it must be exposed to for enough energy to accumulate to result in injury. For behavioral effects, the exposure criterion for sturgeon is expressed as a root-mean-square sound pressure level (SPL_{rms}= 150 dB re 1 μPa).

Exposure to impulsive underwater noise levels of 206 dB re 1 μPa (SPL_{peak}) or 187 dB re 1 μPa^{2}s (SEL_{cum}) can result in injury to sturgeon.

As shown in **Table 7**, 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_{cum} exposure criterion, injury to a sturgeon potentially could occur if the fish remained within 30 meters (98 feet) while the pile was being driven. In order to be exposed to potentially injurious levels of noise during installation of the piles, a sturgeon would need to remain within 30 meters of the pile during the time it is being driven in order to be exposed to this SEL_{cum} threshold. 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 165 feet 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 100 feet 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 165 feet 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 ensonified area. It is extremely unlikely that these movements will 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 ensonified area 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.

Mitigation Measures for Underwater Noise from Pile Driving

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. The estimated effects of using a bubble curtain were not included in the calculation of threshold distances using the GARFO SAF spreadsheet model.

Vessel Noise

Noise generated by vessels during project construction or vessels calling on the pier during its operation potentially could affect sturgeon in the Proposed Action 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. Large ships tend to be noisier than small ones, and ships with a full load (including towing or pushing a load) tend to be noisier than unloaded vessels. Vessel noise is a combination of narrow-band (tonal) sound and broadband sound. The intensity of noise produced is approximately related to the size and speed of the vessel. Individual vessels may generate very different sound levels and have different frequency characteristics depending on factors such as the propulsion system and whether there is propeller cavitation or singing (Spiga et al. 2012).

Noise from vessels traveling to and from the pier potentially would cause behavioral disturbance to sturgeon but would not result in injury. Smaller ships such as tugs or trawlers produce broadband noise with a source level (SPL) of typically 168 to 170 dB re 1µ Pa at 1 meter, while larger ships such as supertankers produce underwater broadband noise at source levels of up to 190 dB re 1 µPa at 1 meter (Spiga et al. 2012). These SPLs at 1 meter are less than the sturgeon noise response criteria for injury and greater than the sturgeon noise response criterion for non-impulsive behavioral effects (**Table 7**). However, a sturgeon would need to be in relatively close proximity to the vessel to experience sound levels that exceed the 150 dB re 1µ Pa behavioral effect threshold.

Impacts from vessel noise would not cause physical injury to sturgeon. 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 NMFS in a 2012 Biological Opinion, 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 vessel noise from construction or operation of the Proposed Action also would be discountable, and any potential effects would be insignificant.

Vessel Strikes

Where there is overlap between vessel traffic and Atlantic sturgeon 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 action 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, temporary, and restricted to a small portion of the overall Project Area on any day that dredging occurs.

Once 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 during the period of operation. However, 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; 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. Also, given that the numbers of sturgeon in the Project Area are small, the risk of vessel strike is extremely low. Additionally, vessels entering the inlet would reduce speed, further reducing the probability of vessels strikes. As a result, the effect of the Proposed Action on the risk of a vessel strike on Atlantic sturgeon in the Project Area is discountable.

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. Increased turbidity from construction activities would likely be short-lived and with proper, required controls, such as turbidity curtains (sediment curtains), turbidity impacts would be reduced. Sediment plumes from construction would likely settle out in a few hours, limiting effects from increased turbidity to the short-term. Increased turbidity has the potential to temporarily impact foraging habitat for the Atlantic sturgeon, and sturgeon may avoid the locally affected area entirely if the sediment load is extremely high. A relatively limited area potentially would be affected temporarily, and extensive areas of unaffected foraging habitat would remain available in the waterways of the action area. Thus, the overall likelihood of the Atlantic sturgeon being adversely affected by turbidity from construction or operation of the Proposed Action would be discountable, and any potential effects would be insignificant.

Effects Determination for Atlantic Sturgeon

The Proposed Action may affect but is not likely to adversely affect Atlantic sturgeon if present in the action area.

Sea Turtles

The time of year when activities occur under the Proposed Action affects the chances for impacts to sea turtles. As shown in **Table 4**, sea turtles potentially occur in the action area only during the seven months of the year when water temperatures are warmest (May through November). Activities occurring in the other five months would have no effect on sea turtles. Construction and operations activities under the Proposed Action potentially could affect sea turtles if present in the action area as a result of pile-driving noise, vessel noise (including dredging noise), vessel strikes, and turbidity due to sediment disturbance during construction and dredging.

Pile-Driving Noise

As discussed for sturgeon, the NOAA Fisheries GARFO Acoustics Tool (GARFO 2020) for analyzing the effects of pile driving in inshore waters on ESA-listed species was used to evaluate potential underwater noise impacts on sea turtles from pile driving during construction of the Proposed Action. The GARFO SAF spreadsheet model was used to estimate the ensonification area from pile-driving in the shallow, inshore bays and waterways of the action area. Based on the characteristics of the proposed pile driving, information for a proxy project from the GARFO SAF spreadsheet is shown in **Table 5**. The estimated noise levels at the source associated with pile driving for the Proposed Action, based on measurements for a proxy project (at a distance of 33 feet), are presented in **Table 6** (GARFO 2020).

The thresholds for effects vary among types of organisms. Effect thresholds have been identified by NOAA Fisheries for fish, sea turtles, and marine mammals. For sea turtles, the estimated distances at which pile-driving noise would equal or exceed injury or behavioral threshold levels are shown in **Table 8**.

Table 8. Estimated Distances to Sea Turtle Injury and Behavioral Thresholds

Pile type	Hammer type	Distance to injury threshold (SPL_{peak} = 226 dB re 1 µPa for TTS, = 232 dB re 1 µPa for PTS)	Distance to injury threshold (SEL_{cum} = 189 dB re 1 µPa^{2}s for TTS, = 204 dB re 1 µPa^{2}s for PTS)	Distance to behavioral threshold (SPL_{rms} = 175 dB re 1 µPa)
24-in concrete	Impact	NA	NA	NA

m = meters; in = inches; dB re 1 µPa = sound exposure level in decibels relative to 1 microPascal; dB re 1 µPa^{2}s = 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; TTS = temporary threshold shift; PTS = permanent threshold shift; NA = not applicable because source level is less than or equal to threshold level
Source: GARFO (2020)

A loss of hearing sensitivity (i.e., an elevated hearing threshold) may result from exposure to sound of sufficient SPL and duration. Such a loss of hearing sensitivity is referred to as a noise-induced threshold shift (TS). If the hearing threshold eventually returns to normal, the TS is referred to as a temporary threshold shift (TTS). If the threshold remains elevated after an extended period of time, the TS that remains is referred to as a permanent threshold shift (PTS). TTS and PTS criteria and thresholds are used to predict auditory effects in sea turtles exposed to underwater noise, which is similar to their use in the development of safe noise exposure guidelines for people in noisy environments. TTS is defined as a temporary, reversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level, and PTS is defined as a permanent, irreversible increase in this threshold (NOAA Fisheries 2018).

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 PTS injury to sea turtles, and exposure to lower levels can result in TTS. As shown in **Table 8**, 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 33 feet 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. Thus, the effects of pile-driving noise on sea turtles during construction of the Proposed Action would be insignificant.

Mitigation Measures for Underwater Noise from Pile Driving

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 to 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 location and be monitored for the presence of sea turtles, has been cleared. A bubble curtain around each pile being driven could be used for noise attenuation. The estimated effects of using a bubble curtain were not included in the calculation of threshold distances using the GARFO SAF spreadsheet model.

Vessel Noise

As described above for sturgeon, noise generated by vessels during project construction or vessels calling on the pier during its operation potentially could affect sea turtles in the action area. Smaller ships such as tugs or trawlers produce broadband noise with a source level (SPL) of typically 168 to 170 dB re 1μ Pa at 1 meter, while larger ships such as supertankers produce underwater broadband noise at source levels of up to 190 dB re 1 μPa at 1 meter (Spiga et al. 2012). These SPLs at 1 meter (3.3 feet) are less than the sea turtle noise response criteria for injury (**Table 8**), and those for smaller ships 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 in close proximity to 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.

Noise from dredging vessels and associated equipment and operations was evaluated by NMFS in a 2012 Biological Opinion, 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 through the use of protected species observers, which can halt dredging operations when a sea turtle is observed within a minimum defined distance (e.g., 1 kilometer) of the dredge (NASA 2018). Thus, the overall likelihood of a sea turtle being adversely affected by vessel noise from construction or operation of the Proposed Action would be discountable, and any potential effects would be insignificant.

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 action 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, temporary, and restricted to a small portion of the overall Project Area on any day that dredging occurs.

Once 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 during the period of operation. 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, and temporary increase in vessel traffic that would be added to existing traffic in the area as a result of the project. 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 vessels strikes. As a result, the effect of the Proposed Action on the risk of a vessel strike on sea turtles in the Project Area is discountable.

Turbidity

Pile driving for pier construction, dredging of channels and turning basins, and placement of dredged sediment would cause temporary increases in suspended sediment, thereby increasing local turbidity. Increased turbidity from construction activities would likely be short-lived and with proper, required controls, such as turbidity curtains (sediment curtains), turbidity impacts would be reduced. Sediment plumes from construction would likely settle out in a few hours, limiting effects from increased turbidity to the short-term. Increased turbidity has the potential to temporarily impact foraging habitat for sea turtles and decrease visibility, and sea turtles may avoid the locally affected area entirely if the sediment load is extremely high. A relatively limited area potentially would be affected temporarily, and extensive areas of unaffected foraging habitat would remain available in the waterways of the action area. Thus, the overall likelihood of sea turtles being adversely affected by turbidity from construction or operation of the Proposed Action would be discountable, and any potential effects would be insignificant.

Effects Determination for Sea Turtles

The Proposed Action may affect but is not likely to adversely affect sea turtles if present in the action area.

Conclusions

The effect determinations for each species discussed above are summarized in **Table 9**.

Table 9. Effects Determinations for Species Under NOAA Fisheries Jurisdiction Potentially Occurring in the Action Area

Common Name	Listing Status	DPS	Effect Determination
Atlantic sturgeon	Threatened/ Endangered	All	May affect, not likely to adversely affect
Leatherback sea turtle	Endangered	N/A	May affect, not likely to adversely affect
Loggerhead sea turtle	Threatened	Northwest Atlantic	May affect, not likely to adversely affect
Kemp's ridley sea turtle	Endangered	N/A	May affect, not likely to adversely affect
Green sea turtle	Threatened	North Atlantic	May affect, not likely to adversely affect

Notes:
DPS = Distinct population segment
N/A = Not applicable

Based on the analysis that all effects of the Proposed Action would be insignificant and/or discountable, we have determined that the Wallops Island Northern Development Project may affect but is not likely to adversely affect any listed species or critical habitat under NOAA Fisheries' jurisdiction. We certify that we have used the best scientific and commercial data available to complete this analysis. We request your concurrence with this determination.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Sincerely,

Shari A. Miller

Shari A. Miller
Center NEPA Manager and
Environmental Planning Lead

Enclosures
Attachment 1, NOAA ESA Section 7 Mapper

cc:
250/Ms. K. Finch
250/Mr. T. Meyer
NMFS/Mr. D. O'Brien
NMFS/Mr. B. Hopper
USACE/Mr. B. Denson
VCSFA/Mr. N. Overby

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ATTACHMENT 1: NOAA FISHERIES ESA MAPPER

Atlantic sturgeon
Adult
Migrating & Foraging
N/A

Acipenser oxyriynchus oxyriynchus
DPS: All DPSs
ESA Status: Threatened/Endangered

Time(s) of year:
01/01 to 12/31
N/A to N/A

Federal Register: 77 FR 5880 and 77 FR 5914
Recovery Plan: N/A

Notes: We expect adult Atlantic sturgeon to opportunistically forage year round as they migrate along the coast to and from their natal spawning grounds (Hilton et al. 2016, p. 8). They may aggregate in ocean and estuarine areas during certain times of year, and exhibit seasonal coastal movements in the spring and fall. We expect that they typically remain within the 50-meter depth contour (Erickson et al. 2011, p. 356, 360), but may be found out to the Exclusive Economic Zone (EEZ)(Stein et al. 2004, p. 174).

Sources: Hilton et al. 2016; Erickson et al. 2011; Stein et al. 2004

River Kilometers (if applicable):
to , (Hilton et al. 2016, p. 8)
to , (GARFO)

Feature ID: ANS_C50_ADU_MAF
Last Updated: 7/12/2017, 8:00 PM

Atlantic sturgeon
Subadult
Migrating & Foraging
N/A

Acipenser oxyriynchus oxyriynchus
DPS: All DPSs
ESA Status: Threatened/Endangered

Time(s) of year:
01/01 to 12/31
N/A to N/A

Federal Register: 77 FR 5880 and 77 FR 5914
Recovery Plan: N/A

Notes: We expect subadult Atlantic sturgeon to opportunistically forage year round as they migrate along the coast to and from their natal rivers (Hilton et al. 2016, p. 8). They may aggregate in ocean and estuarine areas during certain times of year, and exhibit seasonal coastal movements in the spring and fall. We expect that they typically remain within the 50-meter depth contour (Erickson et al. 2011, p. 356, 360), but may be found out to the Exclusive Economic Zone (EEZ)(Stein et al. 2004, p. 174).

Sources: Hilton et al. 2016; Erickson et al. 2011; Stein et al. 2004

River Kilometers (if applicable):
to , (Hilton et al. 2016, p. 8)
to , (GARFO)

Feature ID: ANS_C50_SUB_MAF
Last Updated: 7/12/2017, 8:00 PM

Green sea turtle
Adults and juveniles
Migrating & Foraging
Massachusetts (S of Cape Cod) through Virginia

Chelonia mydas
DPS: North Atlantic DPS
ESA Status: Threatened

Time(s) of year:
5/1 to 11/30
to

Federal Register: 81 FR 20057
Recovery Plan: NMFS & USFWS 1991

Notes: In general, juvenile and adult green sea turtles migrate north in the spring as water temperatures warm, arriving in mid-Atlantic waters in May. As the waters cool in the fall, the trend is reversed with most sea turtles leaving the area by the end of November. The waters south of Cape Cod were delineated based on Ecological Protection Units (EPUs), as defined by the Northeast Fisheries Science Center.

Sources: [Loggerhead] Shoop and Kenney 1992; [Green]USFWS 2015; [Kemp's ridley] NMFS and USFWS 2015

Feature ID: GRN_STS_AJV_MAF
Last Updated: 3/26/2017, 8:00 PM

Kemp's ridley sea turtle
Adults and juveniles
Migrating & Foraging
Massachusetts (S of Cape Cod) through Virginia

Lepidochelys kempii
DPS: N/A
ESA Status: Endangered

Time(s) of year:
5/1 to 11/30
to

Federal Register: 35 FR 18319
Recovery Plan: NMFS et al. 2011

Notes: In general, juvenile and adult Kemp’s ridley sea turtles migrate north in the spring as water temperatures warm, arriving in mid-Atlantic waters in May. As the waters cool in the fall, the trend is reversed with most sea turtles leaving the area by the end of November. The waters south of Cape Cod were delineated based on

Ecological Protection Units (EPUs), as defined by the Northeast Fisheries Science Center.

Sources: [Loggerhead] Shoop and Kenney 1992; [Green]USFWS 2015; [Kemp's ridley] NMFS and USFWS 2015

Feature ID: KMP_STS_AJV_MAF
Last Updated: 3/26/2017, 8:00 PM

Leatherback sea turtle
Adults and juveniles
Migrating & Foraging
Massachusetts (S of Cape Cod) through Virginia

Dermochelys coriacea
DPS: N/A
ESA Status: Endangered

Time(s) of year:
5/1 to 11/30
to

Federal Register: 35 FR 849
Recovery Plan: NMFS & USFWS 1992

Notes: In general, juvenile and adult leatherback sea turtles migrate north in the spring as water temperatures warm, arriving in mid-Atlantic waters in May. As the waters cool in the fall, the trend is reversed with most sea turtles leaving the area by the end of November. The waters south of Cape Cod were delineated based on Ecological Protection Units (EPUs), as defined by the Northeast Fisheries Science Center.

Sources: [Loggerhead] Shoop and Kenney 1992; [Green]USFWS 2015; [Kemp's ridley] NMFS and USFWS 2015

Feature ID: LTR_STS_AJV_MAF
Last Updated: 3/26/2017, 8:00 PM

Loggerhead sea turtle
Adults and juveniles
Migrating & Foraging
Massachusetts (S of Cape Cod) through Virginia

Caretta caretta
DPS: Northwest Atlantic DPS
ESA Status: Threatened

Time(s) of year:
5/1 to 11/30
to

Federal Register: 76 FR 58868
Recovery Plan: NMFS & USFWS 2008

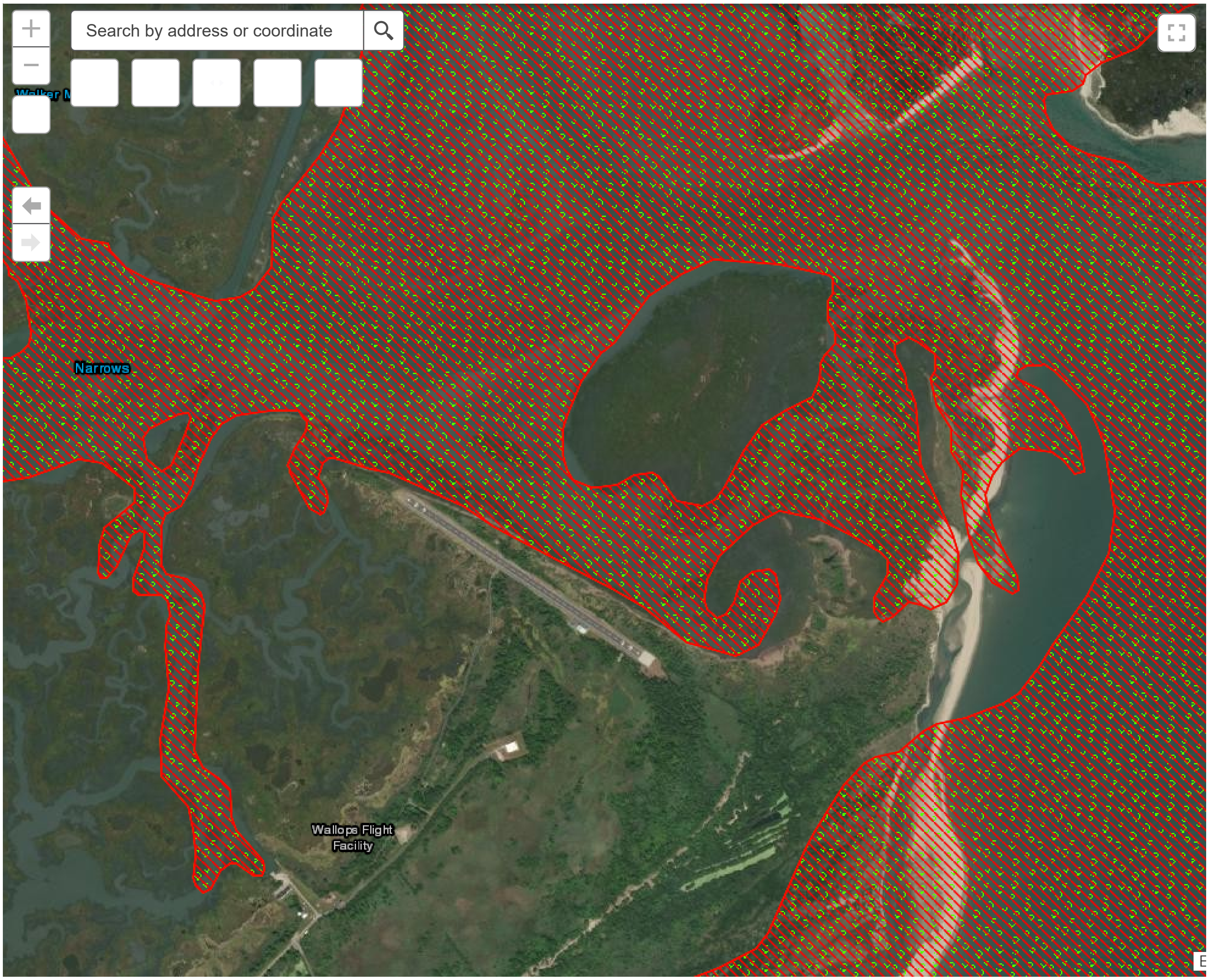
Notes: In general, juvenile and adult loggerhead sea turtles migrate north in the spring as water temperatures warm, arriving in mid-Atlantic waters in May. As the waters cool in the fall, the trend is reversed with most sea turtles leaving the area by the end of November. The waters south of Cape Cod were delineated based on Ecological Protection Units (EPUs), as defined by the Northeast Fisheries Science Center.

Sources: [Loggerhead] Shoop and Kenney 1992; [Green]USFWS 2015; [Kemp's ridley] NMFS and USFWS 2015

Feature ID: LOG_STS_AJV_MAF
Last Updated: 3/26/2017, 8:00 PM

ESA Section 7 Mapper

NOAA Fisheries Greater Atlantic Region



Atlantic Sturgeon Sea Turtles

0.2mi

-75.416 37.901 Degrees

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APPENDIX F –

CULTURAL RESOURCES

From:	Stanley, Randall M. (WFF-2280) <randall.m.stanley@nasa.gov>
Sent:	Friday, September 10, 2021 10:52 AM
To:	Caitlin.Rogers@catawba.com
Cc:	Miller, Shari A. (WFF-2500); Nate Overby
Subject:	Section 106 Consultation for Wallops Island Northern Development at NASA WFF
Attachments:	Catawba - NASA WIND_THPO Letter_10 September 2021_VCSFA.pdf

Good Morning Dr. Rogers,

NASA Wallops Flight Facility (WFF) is seeking to establish a new intermodal facility at Wallops Island, Virginia as part of the United States Maritime Administration (MARAD) M-95 "Marine Highway Project" designed to expand the use of America's navigable waters. As part of this project, an Environmental Analysis (EA) is being prepared. NASA contracted with AECOM Technical Services to fulfil Section 106 requirements of the National Historic Preservation Act of 1966 by conducting a Phase I marine archaeological survey for the proposed construction and operation of a Wallops Island Pier Area, and a Phase I terrestrial archaeological survey for proposed construction of a hangar, both located at the north end of Wallops Island in proximity to the Mid-Atlantic Regional Spaceport (MARS) Unmanned Aerial Systems (UAS) airstrip.

Please refer to the attached letter for more information on this project; I will be happy to send a hard copy of this letter upon request. However, please note that the 3 enclosure mentioned at the end of the letter consist of many pages, so I respectfully request that you access these documents using the link below:

https://marsspaceport.sharepoint.us/:f:/g/Ekrveb4iIbZLrI2zlZap8ewBsUotRN5uYsExu7t2QPZzLA?e=Bh1RLF

If you have any questions, please do not hesitate to contact me at the below.

Sincerely,

Randall M. Stanley
NASA / WFF FMB, Code 228
Building N-161, Room 132
Wallops Island, VA 23337

Direct: 757-824-1309
Cell: 410-422-2131
Fax: 757-824-1831
http://www.wff.nasa.gov

National Aeronautics and Space Administration

Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337

Reply to Attn of: 228 September 10, 2021

Catawba Indian Nation
Attn: Dr. Caitlin Rogers
1536 Tom Stevens Road
Rock Hill, SC 29730

RE: Section 106 Consultation for Wallops Island Northern Development at NASA WFF

Dear Dr. Rogers:

NASA Wallops Flight Facility (WFF) is seeking to establish a new intermodal facility at Wallops Island as part of the United States Maritime Administration (MARAD) M-95 "Marine Highway Project" designed to expand the use of America's navigable waters (Figure 1). The proposed infrastructure developments would provide a port and operations area, including enhanced operational capabilities for the Virginia Commercial Spaceflight Authority (VCSFA), herein referred to as the Wallops Island Northern Development (WIND) project. VCSFA, through the Mid-Atlantic Regional Spaceport (MARS), owns and operates the existing Unmanned Aerial Systems (UAS) airstrip on the north end of Wallops Island.

NASA is preparing an Environmental Assessment (EA) in compliance with the National Environmental Policy Act (NEPA) tiered from the May 2019 *NASA WFF Site-Wide Programmatic Environmental Impact Statement (Final Site-wide PEIS)*, in which NASA evaluated the environmental consequences of constructing and operating new facilities and infrastructure at WFF.

As the federal landowner, NASA would grant the land use agreement for the Proposed Action and is the lead federal agency for this undertaking. MARAD is a cooperating agency on the EA since they may grant funds toward construction of the pier and port area. USACE is serving as a cooperating agency on the EA 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.

To this end, NASA has assumed the role of Lead Federal Agency for NHPA compliance and both MARAD and USACE are participating in NASA's Section 106 process. The effects of their actions are considered in all project documents, including this correspondence.

Pursuant to Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, NASA would like to initiate government-to-government consultation concerning the Undertaking to allow you and your designee the opportunity to identify any comments, concerns, and

suggestions you might have. As we move forward through this process, we welcome your participation and input.

Background

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 United States (U.S.) government agencies access to resources such as special use (i.e., restricted) airspace, research runways, and launch pads.

The VCSFA 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 Science, Technology, Engineering, and Math (STEM) 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 launches to orbital trajectories. This led to the establishment of MARS.

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.

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 (https://www.maritime.dot.gov/sites/marad.dot.gov/files/docs/grants-finances/marine-highways/3071/marine-highway-project-description-pages-1-27-2020.pdf; page 36).

The M-95 Marine Highway Corridor 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 has the potential to support the growth of existing operations at WFF, enhance STEM research opportunities, and spur high-tech/high-paying jobs in a predominantly rural area (https://cms.marad.dot.gov/sites/marad.dot.gov/files/2021-05/Route%20Designation%20one-pagers%20May%202021.pdf; page 25).

Construction of the MARS Port area would provide safe and secure barge access and berthing to offload large launch vehicle components and related equipment for MARS and NASA. Development of a port and operations area at the north end of Wallops Island to support the activities of NASA, WFF tenants, and MARS was evaluated at a programmatic level of detail in the 2019 *Final Site-wide PEIS*.

Description of the Undertaking

NASA initially considered seven alternatives for the Proposed Action along with the No Action Alternative. Five of the eight action alternatives for the proposed MARS Port were dismissed from further consideration because they failed to meet the Purpose and Need. These five alternative locations are outside of the secured boundaries of the MARS UAS Airfield, which would severely limit the use of the MARS Port based on security requirements of potential clients.

As part of the Undertaking, 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. The MARS Port would provide a port and operations area along with associated capabilities for MARS, NASA WFF, and other customers. The MARS Port would also serve as a new intermodal facility as part of the MARAD M-95 Marine Highway Corridor. Infrastructure (new facilities and access road, runway, and utilities improvements) would likewise be constructed and installed as part of the Proposed Action. The Undertaking would also include the dredging of an existing channel for enhanced vessel approach purposes. The vessel approach channel, which interfaces with both the Chincoteague Inlet Federal Channel and the Bogues Bay connecting waterways, would initially be used by an assortment of shallow draft manned and unmanned vessels. A variety of additional infrastructure elements and facilities as described below would also be constructed to further support the MARS Port operations.

This Undertaking is the Proposed Action Alternative being analyzed in the EA, along with the No Action Alternative, and consists of the following specific actions (Figures 2-4):

- Channel and turning basin dredging;
- Construction of a new pier for barge access and berthing;
- Construction of a second hangar at the UAS airstrip;
- Installation of new potable and wastewater lines to the hangars (existing and proposed);
- Installation of new of airstrip lighting;
- 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 vehicle parking lot;
- Widening of the existing access road culvert; and
- Construction of a new project support building.

Construction of the dredging and pier elements of the Undertaking would be carried out in three (3) 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 Mean Lower Low Water [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;
- **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 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 11,800 ft-long portion of channel from the Phase 2 turning basin to where it meets with the Chincoteague Inlet Federal Channel.

Although the Undertaking is anticipated to include all three phases of dredging and pier construction, there are two alternative implementations being considered. Under Alternative 1, only Phase 1 of the Undertaking would be implemented, while under Alternative 2, only Phases 1 and 2 would be implemented. The infrastructure and facilities would be constructed regardless of the phases of the dredging and piers construction ultimately implemented.

The elements of the Undertaking are described below in three main groupings: Channel Dredging, Port Components, and Other Infrastructure and Facilities.

Channel Dredging

The Undertaking would include the dredging of an existing channel for enhanced vessel approach purposes. 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 requiring approximately 2 m (8 ft) of draft. The vessel approach channel interfaces with both the Chincoteague Inlet Federal Channel and the Bogues Bay connecting waterways**.** 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; the proposed width of the approach channel (30 m [100-ft]) is consistent with the dimensions of the Federal Channel.

There are five potential sites being evaluated for the placement of dredged material, which are discussed below (Figure 2). Further geotechnical investigation and associated physical and chemical laboratory analysis of sediment samples in the areas to be dredged would be required prior to dredging to determine the viability of the placement sites.

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 miles). Open water placement options typically present the lowest cost dredging option and allows 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 permit would be required for the use of this site.

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. Specifically, there are low lying areas in the vicinity of the culvert crossing 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 the USACE. The 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 miles) 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. The use of this option is unlikely as it currently does not have capacity for additional dredge spoil.

Option 4: Wallops Island Shoreline Protection Placement

This option would involve the beneficial reuse of clean, compatible sand from the dredged material to repair and protect areas of the shoreline within the Operations Range area on Wallops Island. The material would be placed along the seawall to protect the beach from tidal impacts or ocean overwash from coastal storms such as hurricanes and northeasters. 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 11 km (6 nautical miles) 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.

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 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. Once pumped, USFWS would assume responsibility for sediment placement and securing appropriate permits.

Port Components

Planned components of the port include construction of a new pier for barge access and berthing. 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 specifically include the following elements (Figure 3):

- 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 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/deepening.
- The deck height (approximately 3.3 m [11 ft] above waterline) would be above the Flood Protection Elevation as a resiliency measure against predicted Sea-Level Rise (SLR) and surge associated with extreme storm events, as well as meeting future vessel deck requirements.
- The access trestle would be supported by piles designed to span over tidal marshes/wetlands. Pile bents would be spaced on approximate 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.

Other Infrastructure and Facilities

A variety of onshore facilities and infrastructure would be constructed or upgraded to support the port operations, which are briefly summarized below (Figure 4).

Second Hangar

A new, approximately 660-sq m (7,125-square ft) hangar would be constructed 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 client usage. A second, secure hangar would allow for use by MARS port/pier clients without hindering usage of the existing hangar for UAS Airfield operations. Existing electrical and communication utilities at the existing hangar would be extended to the new hangar.

Potable Water and Wastewater Lines to Hangars

Potable water would be supplied from the elevated north end tank (V-090). 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 conduit would be extended from the existing hangar to the proposed hangar at the UAS Airstrip. 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 edges of the runway (one light every 61 m [200 ft]). Lights would only be turned on when required by an airfield operation (i.e., aircraft takeoffs or landings) and turned off when the operation is completed.

Airstrip Access Road Improvements (culvert widening)

A 40-m (130-ft) segment of the existing paved access road would be widened to 9 m (30 ft) to enlarge the culvert for the drainage channels to Cow Gut.

Vehicle Parking Lot

A new parking area with spaces for up to 30 vehicles would be constructed near the northwest intersection of the UAS airstrip access road and runway. This proposed parking lot would occupy approximately 0.75 acres of primarily forested uplands.

Runway Hardening for Port Access

A 30.5-m (100-ft) wide section of runway would be improved (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 access road would be constructed along the north side of the existing UAS airstrip from the intersection with the access road to the new MARS Port pier area.

<u>Project Support Building (i.e., North Island Operations Center)</u>

A new, approximately 740-square meter (sq m) (8,000-square foot [sq ft]) building may be constructed at the general location of the existing Lifesaving Station on the southwest end of the access road to the UAS airstrip. The facility would serve as a new North Island Operations Center. Electrical, potable water, wastewater, and communications utilities would be extended to this facility from existing nearby infrastructure.

Area of Potential Effects and Identification of Historic Properties

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

As described in the 2019 *Final Site-wide PEIS*, in accordance with Sections 106 and 110 of the NHPA, NASA developed a Programmatic Agreement (PA) with the Virginia SHPO and Advisory Council on Historic Preservation to outline how WFF will manage its cultural resources as an integral part of its operations and missions: *Programmatic Agreement Among the National Aeronautics and Space Administration, the Virginia State Historic Preservation Office, and the Advisory Council On Historic Preservation Regarding the Management of Facilities, Infrastructure, and Sites at the National Aeronautics and Space Administration's Wallops Flight Facility, Wallops Island, Accomack County, Virginia* (NASA 2014, 2016).

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 PA. The PA 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

Area of Potential Effects (APE)

The APE, as defined in 36 CFR Part 800.16(d), is “the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.”

For this undertaking, the APE has three components: the terrestrial archaeological APE, the marine archaeological APE, and the above-ground APE (Figure 5). NASA has defined the terrestrial archaeological Area of Potential Effects (APE) as the proposed limits of disturbance for the undertaking in upland areas. NASA has defined the marine archaeological APE as the proposed limits of disturbance for the undertaking in marine areas. Due to the low vertical profile of the project elements, NASA has defined the above-ground APE as a 0.8-kilometer (0.5-mile) radius buffer around the proposed limits of disturbance, both terrestrial and marine.

Figure 6 provides a Preliminary APE for the dredge spoil placement locations. Additional environmental and engineering evaluations are necessary to determine the preferred dredge spoil placement location for this undertaking. NASA will consult with DHR once the specific location has been identified.

Identification of Historic Properties

NASA used a combination of existing data review and Phase I archaeological surveys to identify historic properties within the APE. Figure 7 shows resources and previous investigations within the APE for the terrestrial and marine components of the project; Figure 8 shows the resources in the vicinity of the dredge placement options; and Figure 9 shows the locations of the three terrestrial and marine archaeological surveys performed in 2021 as part of identification and evaluation efforts.

The terrestrial elements of the undertaking are located within the boundary of Wallops Island Flight Facility Historic District (DHR ID 001-0027), which was determined Not Eligible for the NRHP on November 4, 2004. This includes seven contributing resources within the Preliminary APE for Dredge Spoil Option 4 (Wallops Island Shoreline Protection Placement) (DHR ID 001-0027-0238, -0239, -0240, -0241, -0242, -0244, and -0251). All seven have been determined Not Eligible for the NRHP. Two additional resources, DHR ID 001-0027-0100 and -0101, are within the APE for the proposed project support building (i.e., North Island Ops Center) and are discussed in more detail, below.

In 2003, NASA modeled all property within WFF’s boundaries for the potential of terrestrial archaeological resources, which is depicted in Appendix A of the PA, which is included as Appendix B in the 2015 *Integrated Cultural Resources Management Plan for Wallops Flight Facility* (2015 ICRMP).

Three archaeological surveys are within the broader above-ground APE: AC-039, AC-049, and AC-076. AC-039 represents the Phase I survey for the proposed DD(x) Wetlands Mitigation project, which documented 44AC0459, discussed in more detail, below. AC-049 is a terrestrial portion of the 2009 terrestrial and marine archaeological surveys conducted for the proposed shoreline restoration and infrastructure protection program. AC-076 represents the Phase I survey of a proposed wetland mitigation bank. None of these surveys intersect the terrestrial archaeological APE and none documented archaeological sites within the terrestrial or marine archaeological APE.

According to NASA's predictive model for prehistoric and historic archaeological sites in the 2015 ICRMP, a number of terrestrial portions of the undertaking along the UAS Airstrip site falls within the area of High archaeological potential, specifically the second hangar, the water and wastewater lines, the airstrip lighting, the runway hardening, and the access road to port. During the NEPA analysis for the construction and operation of the UAS Airstrip, NASA performed a Phase I archaeological survey, which included the proposed UAS Airstrip, two hangars, and the access roadway (Chris Espenshade and Kirstie Lockerman, 2009, *Cultural Resources Investigations of the Proposed Uninhabited Aerial Systems Airstrip, Wallops Flight Facility, Accomack County, Virginia*, New South Associates). The survey resulted in the documentation of 44AC0089, a terrestrial earthwork dating to the Revolutionary War and located approximately 60 m (200 ft) northeast of the APE near the UAS Airstrip. This survey encompassed all the aforementioned terrestrial portions of the undertaking except for the second hangar, the proposed location of which was not included in the 2009 survey.

NASA performed a Phase I archaeological survey of the proposed second hangar in 2021. The report of these investigations, *NASA Wallops Flight Facility Phase I Archaeological Survey for the Wallops Island North Development Project, Wallops Island Virginia* by Kathleen Furgerson and Kelsey Johnson, is enclosed with this letter. This Phase I survey did not document any archaeological resources. The rest of the terrestrial archaeological APE near the UAS Airstrip has been previously disturbed as a result of construction of the airstrip.

The remaining terrestrial portions of the undertaking in the vicinity of the existing UAS Airstrip, the airstrip access road improvements and the vehicle parking lot, area within an area of Low archaeological potential (2015 ICRMP). Both are in areas of poorly drained soil; the access road is located on a constructed berm.

The proposed project support building (i.e., North Island Ops Center) will be built in the former location of the Wallops Beach Lifesaving Station (DHR ID 001-0027-0100), which was determined eligible for the NRHP on November 4, 2004. NASA notified DHR of their intent to demolish the Wallops Beach Lifesaving Station in a letter dated February 29, 2016. As mitigation for the adverse effect, the resource was documented via HABS recordation and a documentary video produced (https://vimeo.com/ursci/review/177622715/b2f6e500b2), pursuant to the PA. DHR concurred that NASA met the requirements outlined in the PA and can proceed with demolition in an email dated March 3, 2020.

This location was subjected to archaeological monitoring conducted by Tetra Tech related to lead remediation activities on January 13, 2014. The remediation activities consisted of the removal of approximately 6 inches of soil within a 4,500 square feet area within a 20-foot radius buffer around the foundation of the Wallops Beach Lifesaving Station. The remediation excavations removed the A horizon and allowed the monitoring archaeologist to inspect the exposed subsoil for evidence of cultural features and artifacts. No cultural features or artifacts were revealed during the remediation activities (*Surface Soil Removal, Former Coast Guard Station [Building V-65], NASA Wallops Island, Wallops Island, Virginia, Archaeological Monitoring Field Summary* n.d.). It is not clear if the remediation activities removed additional soil after the conclusion of the archaeological monitoring. While this location is in an area of high archaeological potential (2015 ICRMP), this location has been disturbed by the lead remediation activities, which did not reveal any cultural features or artifacts. Based on the previous disturbance and lack of archaeological remains, no archaeological survey is recommended for this location.

The Wallops Beach Station Observation Tower (DHR ID 001-0027-0101), which is associated with the Wallops Beach Lifesaving Station, is also located adjacent to the proposed North Island Ops Center. The tower is not individually eligible for the NRHP but contributes to the eligibility of the Wallops Beach Lifesaving Station, which is slated for demolition. As the tower is not individually eligible, and as the historic property to which it contributed is slated for demolition and mitigation for this adverse effect has been implemented pursuant to the PA, NASA has determined that Wallops Beach Station Observation Tower is no longer an historic property.

Site 44AC0459 is located adjacent to the proposed North Island Ops Center, which is the former location of the Wallops Beach Lifesaving Station and Observation Tower (DHR ID 001-0027-0100). Site 44AC0459 yielded artifacts from the mid-eighteenth through twentieth century and is associated with the old Coast Guard Station trash disposal patterns and mid-to-late twentieth century NASA activities. According to V-CRIS, the site is unassessed for the NRHP. The site is located outside of the APE.

The marine portions of the undertaking, specifically the port improvements and the navigation channel, extend from the northwestern end of the UAS Airstrip and arc around the northeastern end of Wallops Island before intersecting with the Chincoteague Inlet Channel. The navigation channel already exists; some portions of the channel are not at the necessary depth and would require dredging, while other portions are already at the necessary depth and thus would not require any new dredging.

NASA conducted a Phase I marine archaeological survey in July 2020 and February 2021 for the marine portions of the undertaking, excluding the area of the proposed channel that do not require dredging. Review of nineteenth and early twentieth-century nautical charts and historic maps of the marine APE did not reveal the potential for significant shipwrecks or potentially submerged maritime industry resources. The marine archaeological survey used nonintrusive geophysical instruments including a side scan sonar, a marine magnetometer, and a single-beam sonar and documented 53 magnetic and 9 acoustic contacts. No potentially significant submerged

archaeological resources were identified within the marine APE. No additional archaeological investigations are recommended of any recorded anomalies from the survey. The report of these investigations, *Marine Archaeological Survey for the Wallops Island Northern Development Project, Wallops Flight Facility, Accomack County, Virginia* by Chris Cartellone and Jean B. Pelletier, is enclosed with this letter.

The five proposed dredge spoil placement locations are located in the vicinity of MARS Port; some are in marine locations (i.e., Option 1, Option 3) and some are in terrestrial or mixed terrestrial/marine locations (i.e., Option 2, Option 4, Option 5).

No known archaeological sites are located within the Wallops Island Open Ocean Placement (Option 1); according to V-CRIS, this location has not been subject to a Phase I archaeological survey. The exact location of the Wallops Island Flood Protection/Upland Placement (Option 2) is currently not known. Generally, though, the location is within an area of Low archaeological potential (2015 ICRMP). It is also within the boundary of DHR ID 001-0027, determined not eligible for the NRHP.

No known archaeological sites are located within the Greenbackville Dredged Material Containment Facility (Option 3); according to V-CRIS, this location has not been subject to a Phase I archaeological survey. Two above-ground resources are in the vicinity of Option 3. DHR ID 001-0028 is the Franklin City Railroad Station, and DHR ID 001-5053is a house at 2937 Franklin City Road. Neither resource has been evaluated for NRHP eligibility.

The exact location of the Wallops Island Shoreline Protection Placement (Option 4) is not known, but it is generally along the shoreline of Wallops Island. It is in the vicinity of DHR ID 001-0027 and a number of contributing resources, all of which have been determined not eligible for the NRHP.

The Chincoteague National Wildlife Refuge Swan Cove Placement (Option 5) is in the vicinity of Little Toms Cove and Swan Cove Pool. Terrestrial portions of Option 5 are within previous archaeological survey AC-015, a 1988 archaeological reconnaissance of Chincoteague National Wildlife Refuge. A number of other previous archaeological surveys have been conducted immediately adjacent to or in the immediate vicinity of Option 5 (AC-007, AC-034, AC-083, AC-089, and AC-093). One previously recorded archaeological site, 44AC0412, is directly adjacent to Option 5 on the west side of Beach Road. The site is the remains of an early twentieth century life saving station and is unassessed for NRHP eligibility.

Determination of Effect

No archaeological historic properties are located within the APE. The Phase I archaeological survey of the proposed hangar and the Phase I marine archaeological survey did not identify any archaeological resources within the APE, and previously recorded sites 44AC0089 and 44AC0459 are located outside of the APE. No above-ground historic properties were identified within the APE.

NASA concludes that there would be "no historic properties affected" by the proposed undertaking. Your concurrence with this determination is respectfully requested.

It is understood that this determination excludes the dredge spoil placement locations. Additional environmental and engineering evaluations are necessary to determine the preferred dredge spoil placement location for this undertaking. NASA will consult with DHR once this location has been identified.

If you have any questions or require additional information, please contact me at Randall.M.Stanley@nasa.gov or (757) 824-1309.

Sincerely,

RANDAL
L
STANLEY

Digitally signed by: RANDALL STANLEY
DN: CN = RANDALL STANLEY C = US O = U.S. Government OU = NASA, People
Date: 2021.09.10 10:38:12 -05'00'

Randall M. Stanley
Cultural Resources Manager

3 Enclosures

-Figures 1-9
-*NASA Wallops Flight Facility, Phase I Archaeological Survey for the Wallops Island North Development Project, Wallops Island, Virginia by Kathleen Furgerson and Kelsey Johnson* (2021)
-*Marine Archaeological Survey for the Wallops Island Northern Development Project, Wallops Flight Facility, Accomack County, Virginia* by Chris Cartellone and Jean B. Pelletier (2021)

cc:
250/Ms. S. Miller
VCSFA/Mr. N. Overby

From:	Stanley, Randall M. (WFF-2280) <randall.m.stanley@nasa.gov>
Sent:	Friday, September 10, 2021 10:52 AM
To:	Jessica.Phillips@cied.org
Cc:	Miller, Shari A. (WFF-2500); Nate Overby
Subject:	Section 106 Consultation for Wallops Island Northern Development at NASA WFF
Attachments:	Chickahominy - NASA WIND_THPO Letter_10 September 2021_VCSFA.pdf

Good Morning Ms. Phillips,

NASA Wallops Flight Facility (WFF) is seeking to establish a new intermodal facility at Wallops Island, Virginia as part of the United States Maritime Administration (MARAD) M-95 "Marine Highway Project" designed to expand the use of America's navigable waters. As part of this project, an Environmental Analysis (EA) is being prepared. NASA contracted with AECOM Technical Services to fulfil Section 106 requirements of the National Historic Preservation Act of 1966 by conducting a Phase I marine archaeological survey for the proposed construction and operation of a Wallops Island Pier Area, and a Phase I terrestrial archaeological survey for proposed construction of a hangar, both located at the north end of Wallops Island in proximity to the Mid-Atlantic Regional Spaceport (MARS) Unmanned Aerial Systems (UAS) airstrip.

Please refer to the attached letter for more information on this project. To access the 3 enclosures mentioned at the end of the letter, please use the link below:

https://marsspaceport.sharepoint.us/:f:/g/Ekrveb4iIbZLrl2zlZap8ewBsUotRN5uYsExu7t2QPZzLA?e=Bh1RLF

If you have any questions, please do not hesitate to contact me at the below.

Sincerely,

Randall M. Stanley
NASA / WFF FMB, Code 228
Building N-161, Room 132
Wallops Island, VA 23337

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http://www.wff.nasa.gov

National Aeronautics and Space Administration

Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337

Reply to Attn of: 228

September 10, 2021

Chickahominy Indians Eastern Division
Attn: Ms. Jessica Phillips
2895 Mount Pleasant Road
Providence Forge, VA 23140

RE: Section 106 Consultation for Wallops Island Northern Development at NASA WFF

Dear Ms. Phillips:

NASA Wallops Flight Facility (WFF) is seeking to establish a new intermodal facility at Wallops Island as part of the United States Maritime Administration (MARAD) M-95 "Marine Highway Project" designed to expand the use of America's navigable waters (Figure 1). The proposed infrastructure developments would provide a port and operations area, including enhanced operational capabilities for the Virginia Commercial Spaceflight Authority (VCSFA), herein referred to as the Wallops Island Northern Development (WIND) project. VCSFA, through the Mid-Atlantic Regional Spaceport (MARS), owns and operates the existing Unmanned Aerial Systems (UAS) airstrip on the north end of Wallops Island.

NASA is preparing an Environmental Assessment (EA) in compliance with the National Environmental Policy Act (NEPA) tiered from the May 2019 *NASA WFF Site-Wide Programmatic Environmental Impact Statement (Final Site-wide PEIS)*, in which NASA evaluated the environmental consequences of constructing and operating new facilities and infrastructure at WFF.

As the federal landowner, NASA would grant the land use agreement for the Proposed Action and is the lead federal agency for this undertaking. MARAD is a cooperating agency on the EA since they may grant funds toward construction of the pier and port area. USACE is serving as a cooperating agency on the EA 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.

To this end, NASA has assumed the role of Lead Federal Agency for NHPA compliance and both MARAD and USACE are participating in NASA's Section 106 process. The effects of their actions are considered in all project documents, including this correspondence.

Pursuant to Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, NASA would like to initiate government-to-government consultation concerning the Undertaking to allow you and your designee the opportunity to identify any comments, concerns, and

suggestions you might have. As we move forward through this process, we welcome your participation and input.

Background

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 United States (U.S.) government agencies access to resources such as special use (i.e., restricted) airspace, research runways, and launch pads.

The VCSFA 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 Science, Technology, Engineering, and Math (STEM) 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 launches to orbital trajectories. This led to the establishment of MARS.

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.

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 (https://www.maritime.dot.gov/sites/marad.dot.gov/files/docs/grants-finances/marine-highways/3071/marine-highway-project-description-pages-1-27-2020.pdf; page 36).

The M-95 Marine Highway Corridor 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 has the potential to support the growth of existing operations at WFF, enhance STEM research opportunities, and spur high-tech/high-paying jobs in a predominantly rural area (https://cms.marad.dot.gov/sites/marad.dot.gov/files/2021-05/Route%20Designation%20one-pagers%20May%202021.pdf; page 25).

Construction of the MARS Port area would provide safe and secure barge access and berthing to offload large launch vehicle components and related equipment for MARS and NASA. Development of a port and operations area at the north end of Wallops Island to support the activities of NASA, WFF tenants, and MARS was evaluated at a programmatic level of detail in the 2019 *Final Site-wide PEIS*.

Description of the Undertaking

NASA initially considered seven alternatives for the Proposed Action along with the No Action Alternative. Five of the eight action alternatives for the proposed MARS Port were dismissed from further consideration because they failed to meet the Purpose and Need. These five alternative locations are outside of the secured boundaries of the MARS UAS Airfield, which would severely limit the use of the MARS Port based on security requirements of potential clients.

As part of the Undertaking, 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. The MARS Port would provide a port and operations area along with associated capabilities for MARS, NASA WFF, and other customers. The MARS Port would also serve as a new intermodal facility as part of the MARAD M-95 Marine Highway Corridor. Infrastructure (new facilities and access road, runway, and utilities improvements) would likewise be constructed and installed as part of the Proposed Action. The Undertaking would also include the dredging of an existing channel for enhanced vessel approach purposes. The vessel approach channel, which interfaces with both the Chincoteague Inlet Federal Channel and the Bogues Bay connecting waterways, would initially be used by an assortment of shallow draft manned and unmanned vessels. A variety of additional infrastructure elements and facilities as described below would also be constructed to further support the MARS Port operations.

This Undertaking is the Proposed Action Alternative being analyzed in the EA, along with the No Action Alternative, and consists of the following specific actions (Figures 2-4):

- Channel and turning basin dredging;
- Construction of a new pier for barge access and berthing;
- Construction of a second hangar at the UAS airstrip;
- Installation of new potable and wastewater lines to the hangars (existing and proposed);
- Installation of new of airstrip lighting;
- 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 vehicle parking lot;
- Widening of the existing access road culvert; and
- Construction of a new project support building.

Construction of the dredging and pier elements of the Undertaking would be carried out in three (3) 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 Mean Lower Low Water [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;
- **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 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 11,800 ft-long portion of channel from the Phase 2 turning basin to where it meets with the Chincoteague Inlet Federal Channel.

Although the Undertaking is anticipated to include all three phases of dredging and pier construction, there are two alternative implementations being considered. Under Alternative 1, only Phase 1 of the Undertaking would be implemented, while under Alternative 2, only Phases 1 and 2 would be implemented. The infrastructure and facilities would be constructed regardless of the phases of the dredging and piers construction ultimately implemented.

The elements of the Undertaking are described below in three main groupings: Channel Dredging, Port Components, and Other Infrastructure and Facilities.

Channel Dredging

The Undertaking would include the dredging of an existing channel for enhanced vessel approach purposes. 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 requiring approximately 2 m (8 ft) of draft. The vessel approach channel interfaces with both the Chincoteague Inlet Federal Channel and the Bogues Bay connecting waterways**.** 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; the proposed width of the approach channel (30 m [100-ft]) is consistent with the dimensions of the Federal Channel.

There are five potential sites being evaluated for the placement of dredged material, which are discussed below (Figure 2). Further geotechnical investigation and associated physical and chemical laboratory analysis of sediment samples in the areas to be dredged would be required prior to dredging to determine the viability of the placement sites.

<u>Option 1: Wallops Open Ocean Dredge Material Placement Area</u>

This area is located just offshore of Wallops Island with a transportation distance of the dredged material of approximately 7 km (4 nautical miles). Open water placement options typically present the lowest cost dredging option and allows 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 permit would be required for the use of this site.

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. Specifically, there are low lying areas in the vicinity of the culvert crossing 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 the USACE. The 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 miles) 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. The use of this option is unlikely as it currently does not have capacity for additional dredge spoil.

Option 4: Wallops Island Shoreline Protection Placement

This option would involve the beneficial reuse of clean, compatible sand from the dredged material to repair and protect areas of the shoreline within the Operations Range area on Wallops Island. The material would be placed along the seawall to protect the beach from tidal impacts or ocean overwash from coastal storms such as hurricanes and northeasters. 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 11 km (6 nautical miles) 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.

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 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. Once pumped, USFWS would assume responsibility for sediment placement and securing appropriate permits.

Port Components

Planned components of the port include construction of a new pier for barge access and berthing. 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 specifically include the following elements (Figure 3):

- 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 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/deepening.
- The deck height (approximately 3.3 m [11 ft] above waterline) would be above the Flood Protection Elevation as a resiliency measure against predicted Sea-Level Rise (SLR) and surge associated with extreme storm events, as well as meeting future vessel deck requirements.
- The access trestle would be supported by piles designed to span over tidal marshes/wetlands. Pile bents would be spaced on approximate 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.

Other Infrastructure and Facilities

A variety of onshore facilities and infrastructure would be constructed or upgraded to support the port operations, which are briefly summarized below (Figure 4).

Second Hangar

A new, approximately 660-sq m (7,125-square ft) hangar would be constructed 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 client usage. A second, secure hangar would allow for use by MARS port/pier clients without hindering usage of the existing hangar for UAS Airfield operations. Existing electrical and communication utilities at the existing hangar would be extended to the new hangar.

Potable Water and Wastewater Lines to Hangars

Potable water would be supplied from the elevated north end tank (V-090). 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 conduit would be extended from the existing hangar to the proposed hangar at the UAS Airstrip. 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 edges of the runway (one light every 61 m [200 ft]). Lights would only be turned on when required by an airfield operation (i.e., aircraft takeoffs or landings) and turned off when the operation is completed.

Airstrip Access Road Improvements (culvert widening)

A 40-m (130-ft) segment of the existing paved access road would be widened to 9 m (30 ft) to enlarge the culvert for the drainage channels to Cow Gut.

Vehicle Parking Lot

A new parking area with spaces for up to 30 vehicles would be constructed near the northwest intersection of the UAS airstrip access road and runway. This proposed parking lot would occupy approximately 0.75 acres of primarily forested uplands.

Runway Hardening for Port Access

A 30.5-m (100-ft) wide section of runway would be improved (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 access road would be constructed along the north side of the existing UAS airstrip from the intersection with the access road to the new MARS Port pier area.

Project Support Building (i.e., North Island Operations Center)

A new, approximately 740-square meter (sq m) (8,000-square foot [sq ft]) building may be constructed at the general location of the existing Lifesaving Station on the southwest end of the access road to the UAS airstrip. The facility would serve as a new North Island Operations Center. Electrical, potable water, wastewater, and communications utilities would be extended to this facility from existing nearby infrastructure.

Area of Potential Effects and Identification of Historic Properties

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

As described in the 2019 *Final Site-wide PEIS*, in accordance with Sections 106 and 110 of the NHPA, NASA developed a Programmatic Agreement (PA) with the Virginia SHPO and Advisory Council on Historic Preservation to outline how WFF will manage its cultural resources as an integral part of its operations and missions: *Programmatic Agreement Among the National Aeronautics and Space Administration, the Virginia State Historic Preservation Office, and the Advisory Council On Historic Preservation Regarding the Management of Facilities, Infrastructure, and Sites at the National Aeronautics and Space Administration's Wallops Flight Facility, Wallops Island, Accomack County, Virginia* (NASA 2014, 2016).

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 PA. The PA 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

Area of Potential Effects (APE)

The APE, as defined in 36 CFR Part 800.16(d), is "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking."

For this undertaking, the APE has three components: the terrestrial archaeological APE, the marine archaeological APE, and the above-ground APE (Figure 5). NASA has defined the terrestrial archaeological Area of Potential Effects (APE) as the proposed limits of disturbance for the undertaking in upland areas. NASA has defined the marine archaeological APE as the proposed limits of disturbance for the undertaking in marine areas. Due to the low vertical profile of the project elements, NASA has defined the above-ground APE as a 0.8-kilometer (0.5-mile) radius buffer around the proposed limits of disturbance, both terrestrial and marine.

Figure 6 provides a Preliminary APE for the dredge spoil placement locations. Additional environmental and engineering evaluations are necessary to determine the preferred dredge spoil placement location for this undertaking. NASA will consult with DHR once the specific location has been identified.

Identification of Historic Properties

NASA used a combination of existing data review and Phase I archaeological surveys to identify historic properties within the APE. Figure 7 shows resources and previous investigations within the APE for the terrestrial and marine components of the project; Figure 8 shows the resources in the vicinity of the dredge placement options; and Figure 9 shows the locations of the three terrestrial and marine archaeological surveys performed in 2021 as part of identification and evaluation efforts.

The terrestrial elements of the undertaking are located within the boundary of Wallops Island Flight Facility Historic District (DHR ID 001-0027), which was determined Not Eligible for the NRHP on November 4, 2004. This includes seven contributing resources within the Preliminary APE for Dredge Spoil Option 4 (Wallops Island Shoreline Protection Placement) (DHR ID 001-0027-0238, -0239, -0240, -0241, -0242, -0244, and -0251). All seven have been determined Not Eligible for the NRHP. Two additional resources, DHR ID 001-0027-0100 and -0101, are within the APE for the proposed project support building (i.e., North Island Ops Center) and are discussed in more detail, below.

In 2003, NASA modeled all property within WFF's boundaries for the potential of terrestrial archaeological resources, which is depicted in Appendix A of the PA, which is included as Appendix B in the 2015 *Integrated Cultural Resources Management Plan for Wallops Flight Facility* (2015 ICRMP).

Three archaeological surveys are within the broader above-ground APE: AC-039, AC-049, and AC-076. AC-039 represents the Phase I survey for the proposed DD(x) Wetlands Mitigation project, which documented 44AC0459, discussed in more detail, below. AC-049 is a terrestrial portion of the 2009 terrestrial and marine archaeological surveys conducted for the proposed shoreline restoration and infrastructure protection program. AC-076 represents the Phase I survey of a proposed wetland mitigation bank. None of these surveys intersect the terrestrial archaeological APE and none documented archaeological sites within the terrestrial or marine archaeological APE.

According to NASA's predictive model for prehistoric and historic archaeological sites in the 2015 ICRMP, a number of terrestrial portions of the undertaking along the UAS Airstrip site falls within the area of High archaeological potential, specifically the second hangar, the water and wastewater lines, the airstrip lighting, the runway hardening, and the access road to port. During the NEPA analysis for the construction and operation of the UAS Airstrip, NASA performed a Phase I archaeological survey, which included the proposed UAS Airstrip, two hangars, and the access roadway (Chris Espenshade and Kirstie Lockerman, 2009, *Cultural Resources Investigations of the Proposed Uninhabited Aerial Systems Airstrip, Wallops Flight Facility, Accomack County, Virginia*, New South Associates). The survey resulted in the documentation of 44AC0089, a terrestrial earthwork dating to the Revolutionary War and located approximately 60 m (200 ft) northeast of the APE near the UAS Airstrip. This survey encompassed all the aforementioned terrestrial portions of the undertaking except for the second hangar, the proposed location of which was not included in the 2009 survey.

NASA performed a Phase I archaeological survey of the proposed second hangar in 2021. The report of these investigations, *NASA Wallops Flight Facility Phase I Archaeological Survey for the Wallops Island North Development Project, Wallops Island Virginia* by Kathleen Furgerson and Kelsey Johnson, is enclosed with this letter. This Phase I survey did not document any archaeological resources. The rest of the terrestrial archaeological APE near the UAS Airstrip has been previously disturbed as a result of construction of the airstrip.

The remaining terrestrial portions of the undertaking in the vicinity of the existing UAS Airstrip, the airstrip access road improvements and the vehicle parking lot, area within an area of Low archaeological potential (2015 ICRMP). Both are in areas of poorly drained soil; the access road is located on a constructed berm.

The proposed project support building (i.e., North Island Ops Center) will be built in the former location of the Wallops Beach Lifesaving Station (DHR ID 001-0027-0100), which was determined eligible for the NRHP on November 4, 2004. NASA notified DHR of their intent to demolish the Wallops Beach Lifesaving Station in a letter dated February 29, 2016. As mitigation for the adverse effect, the resource was documented via HABS recordation and a documentary video produced (https://vimeo.com/ursci/review/177622715/b2f6e500b2), pursuant to the PA. DHR concurred that NASA met the requirements outlined in the PA and can proceed with demolition in an email dated March 3, 2020.

This location was subjected to archaeological monitoring conducted by Tetra Tech related to lead remediation activities on January 13, 2014. The remediation activities consisted of the removal of approximately 6 inches of soil within a 4,500 square feet area within a 20-foot radius buffer around the foundation of the Wallops Beach Lifesaving Station. The remediation excavations removed the A horizon and allowed the monitoring archaeologist to inspect the exposed subsoil for evidence of cultural features and artifacts. No cultural features or artifacts were revealed during the remediation activities (*Surface Soil Removal, Former Coast Guard Station [Building V-65], NASA Wallops Island, Wallops Island, Virginia, Archaeological Monitoring Field Summary* n.d.). It is not clear if the remediation activities removed additional soil after the conclusion of the archaeological monitoring. While this location is in an area of high archaeological potential (2015 ICRMP), this location has been disturbed by the lead remediation activities, which did not reveal any cultural features or artifacts. Based on the previous disturbance and lack of archaeological remains, no archaeological survey is recommended for this location.

The Wallops Beach Station Observation Tower (DHR ID 001-0027-0101), which is associated with the Wallops Beach Lifesaving Station, is also located adjacent to the proposed North Island Ops Center. The tower is not individually eligible for the NRHP but contributes to the eligibility of the Wallops Beach Lifesaving Station, which is slated for demolition. As the tower is not individually eligible, and as the historic property to which it contributed is slated for demolition and mitigation for this adverse effect has been implemented pursuant to the PA, NASA has determined that Wallops Beach Station Observation Tower is no longer an historic property.

Site 44AC0459 is located adjacent to the proposed North Island Ops Center, which is the former location of the Wallops Beach Lifesaving Station and Observation Tower (DHR ID 001-0027-0100). Site 44AC0459 yielded artifacts from the mid-eighteenth through twentieth century and is associated with the old Coast Guard Station trash disposal patterns and mid-to-late twentieth century NASA activities. According to V-CRIS, the site is unassessed for the NRHP. The site is located outside of the APE.

The marine portions of the undertaking, specifically the port improvements and the navigation channel, extend from the northwestern end of the UAS Airstrip and arc around the northeastern end of Wallops Island before intersecting with the Chincoteague Inlet Channel. The navigation channel already exists; some portions of the channel are not at the necessary depth and would require dredging, while other portions are already at the necessary depth and thus would not require any new dredging.

NASA conducted a Phase I marine archaeological survey in July 2020 and February 2021 for the marine portions of the undertaking, excluding the area of the proposed channel that do not require dredging. Review of nineteenth and early twentieth-century nautical charts and historic maps of the marine APE did not reveal the potential for significant shipwrecks or potentially submerged maritime industry resources. The marine archaeological survey used nonintrusive geophysical instruments including a side scan sonar, a marine magnetometer, and a single-beam sonar and documented 53 magnetic and 9 acoustic contacts. No potentially significant submerged

archaeological resources were identified within the marine APE. No additional archaeological investigations are recommended of any recorded anomalies from the survey. The report of these investigations, *Marine Archaeological Survey for the Wallops Island Northern Development Project, Wallops Flight Facility, Accomack County, Virginia* by Chris Cartellone and Jean B. Pelletier, is enclosed with this letter.

The five proposed dredge spoil placement locations are located in the vicinity of MARS Port; some are in marine locations (i.e., Option 1, Option 3) and some are in terrestrial or mixed terrestrial/marine locations (i.e., Option 2, Option 4, Option 5).

No known archaeological sites are located within the Wallops Island Open Ocean Placement (Option 1); according to V-CRIS, this location has not been subject to a Phase I archaeological survey. The exact location of the Wallops Island Flood Protection/Upland Placement (Option 2) is currently not known. Generally, though, the location is within an area of Low archaeological potential (2015 ICRMP). It is also within the boundary of DHR ID 001-0027, determined not eligible for the NRHP.

No known archaeological sites are located within the Greenbackville Dredged Material Containment Facility (Option 3); according to V-CRIS, this location has not been subject to a Phase I archaeological survey. Two above-ground resources are in the vicinity of Option 3. DHR ID 001-0028 is the Franklin City Railroad Station, and DHR ID 001-5053is a house at 2937 Franklin City Road. Neither resource has been evaluated for NRHP eligibility.

The exact location of the Wallops Island Shoreline Protection Placement (Option 4) is not known, but it is generally along the shoreline of Wallops Island. It is in the vicinity of DHR ID 001-0027 and a number of contributing resources, all of which have been determined not eligible for the NRHP.

The Chincoteague National Wildlife Refuge Swan Cove Placement (Option 5) is in the vicinity of Little Toms Cove and Swan Cove Pool. Terrestrial portions of Option 5 are within previous archaeological survey AC-015, a 1988 archaeological reconnaissance of Chincoteague National Wildlife Refuge. A number of other previous archaeological surveys have been conducted immediately adjacent to or in the immediate vicinity of Option 5 (AC-007, AC-034, AC-083, AC-089, and AC-093). One previously recorded archaeological site, 44AC0412, is directly adjacent to Option 5 on the west side of Beach Road. The site is the remains of an early twentieth century life saving station and is unassessed for NRHP eligibility.

Determination of Effect

No archaeological historic properties are located within the APE. The Phase I archaeological survey of the proposed hangar and the Phase I marine archaeological survey did not identify any archaeological resources within the APE, and previously recorded sites 44AC0089 and 44AC0459 are located outside of the APE. No above-ground historic properties were identified within the APE.

NASA concludes that there would be "no historic properties affected" by the proposed undertaking. Your concurrence with this determination is respectfully requested.

It is understood that this determination excludes the dredge spoil placement locations. Additional environmental and engineering evaluations are necessary to determine the preferred dredge spoil placement location for this undertaking. NASA will consult with DHR once this location has been identified.

If you have any questions or require additional information, please contact me at Randall.M.Stanley@nasa.gov or (757) 824-1309.

Sincerely,

RANDAL
L
STANLEY

Digitally signed by: RANDALL STANLEY
DN: CN = RANDALL STANLEY C = US O = U.S. Government OU = NASA, People
Date: 2021.09.10 10:49:09 -05'00'

Randall M. Stanley
Cultural Resources Manager

3 Enclosures

-Figures 1-9
-*NASA Wallops Flight Facility, Phase I Archaeological Survey for the Wallops Island North Development Project, Wallops Island, Virginia by Kathleen Furgerson and Kelsey Johnson* (2021)
-*Marine Archaeological Survey for the Wallops Island Northern Development Project, Wallops Flight Facility, Accomack County, Virginia* by Chris Cartellone and Jean B. Pelletier (2021)

cc:
250/Ms. S. Miller
VCSFA/Mr. N. Overby

From:	Stanley, Randall M. (WFF-2280) <randall.m.stanley@nasa.gov>
Sent:	Friday, September 10, 2021 10:52 AM
To:	debra.hansen@pamunkey.org
Cc:	Miller, Shari A. (WFF-2500); Nate Overby
Subject:	Section 106 Consultation for Wallops Island Northern Development at NASA WFF
Attachments:	Pamunkey - NASA WIND_THPO Letter_10 September 2021_VCSFA.pdf

Good Morning Ms. Hansen,

NASA Wallops Flight Facility (WFF) is seeking to establish a new intermodal facility at Wallops Island, Virginia as part of the United States Maritime Administration (MARAD) M-95 "Marine Highway Project" designed to expand the use of America's navigable waters. As part of this project, an Environmental Analysis (EA) is being prepared. NASA contracted with AECOM Technical Services to fulfil Section 106 requirements of the National Historic Preservation Act of 1966 by conducting a Phase I marine archaeological survey for the proposed construction and operation of a Wallops Island Pier Area, and a Phase I terrestrial archaeological survey for proposed construction of a hangar, both located at the north end of Wallops Island in proximity to the Mid-Atlantic Regional Spaceport (MARS) Unmanned Aerial Systems (UAS) airstrip.

Please refer to the attached letter for more information on this project. To access the 3 enclosures mentioned at the end of the letter, please use the link below:

https://marsspaceport.sharepoint.us/:f:/g/Ekrveb4iIbZLrl2zlZap8ewBsUotRN5uYsExu7t2QPZzLA?e=Bh1RLF

If you have any questions, please do not hesitate to contact me at the below.

Sincerely,

Randall M. Stanley
NASA / WFF FMB, Code 228
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Wallops Island, VA 23337

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http://www.wff.nasa.gov

National Aeronautics and Space Administration

Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337

Reply to Attn of: 228 September 10, 2021

Pamunkey Indian Nation
Attn: Ms. Debra Hansen
1054 Pocahontas Trail
King William, VA 23086

RE: Section 106 Consultation for Wallops Island Northern Development at NASA WFF

Dear Ms. Hansen:

NASA Wallops Flight Facility (WFF) is seeking to establish a new intermodal facility at Wallops Island as part of the United States Maritime Administration (MARAD) M-95 "Marine Highway Project" designed to expand the use of America's navigable waters (Figure 1). The proposed infrastructure developments would provide a port and operations area, including enhanced operational capabilities for the Virginia Commercial Spaceflight Authority (VCSFA), herein referred to as the Wallops Island Northern Development (WIND) project. VCSFA, through the Mid-Atlantic Regional Spaceport (MARS), owns and operates the existing Unmanned Aerial Systems (UAS) airstrip on the north end of Wallops Island.

NASA is preparing an Environmental Assessment (EA) in compliance with the National Environmental Policy Act (NEPA) tiered from the May 2019 *NASA WFF Site-Wide Programmatic Environmental Impact Statement (Final Site-wide PEIS)*, in which NASA evaluated the environmental consequences of constructing and operating new facilities and infrastructure at WFF.

As the federal landowner, NASA would grant the land use agreement for the Proposed Action and is the lead federal agency for this undertaking. MARAD is a cooperating agency on the EA since they may grant funds toward construction of the pier and port area. USACE is serving as a cooperating agency on the EA 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.

To this end, NASA has assumed the role of Lead Federal Agency for NHPA compliance and both MARAD and USACE are participating in NASA's Section 106 process. The effects of their actions are considered in all project documents, including this correspondence.

Pursuant to Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, NASA would like to initiate government-to-government consultation concerning the Undertaking to allow you and your designee the opportunity to identify any comments, concerns, and

suggestions you might have. As we move forward through this process, we welcome your participation and input.

Background

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 United States (U.S.) government agencies access to resources such as special use (i.e., restricted) airspace, research runways, and launch pads.

The VCSFA 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 Science, Technology, Engineering, and Math (STEM) 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 launches to orbital trajectories. This led to the establishment of MARS.

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.

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 (https://www.maritime.dot.gov/sites/marad.dot.gov/files/docs/grants-finances/marine-highways/3071/marine-highway-project-description-pages-1-27-2020.pdf; page 36).

The M-95 Marine Highway Corridor 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 has the potential to support the growth of existing operations at WFF, enhance STEM research opportunities, and spur high-tech/high-paying jobs in a predominantly rural area (https://cms.marad.dot.gov/sites/marad.dot.gov/files/2021-05/Route%20Designation%20one-pagers%20May%202021.pdf; page 25).

Construction of the MARS Port area would provide safe and secure barge access and berthing to offload large launch vehicle components and related equipment for MARS and NASA. Development of a port and operations area at the north end of Wallops Island to support the activities of NASA, WFF tenants, and MARS was evaluated at a programmatic level of detail in the 2019 *Final Site-wide PEIS*.

Description of the Undertaking

NASA initially considered seven alternatives for the Proposed Action along with the No Action Alternative. Five of the eight action alternatives for the proposed MARS Port were dismissed from further consideration because they failed to meet the Purpose and Need. These five alternative locations are outside of the secured boundaries of the MARS UAS Airfield, which would severely limit the use of the MARS Port based on security requirements of potential clients.

As part of the Undertaking, 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. The MARS Port would provide a port and operations area along with associated capabilities for MARS, NASA WFF, and other customers. The MARS Port would also serve as a new intermodal facility as part of the MARAD M-95 Marine Highway Corridor. Infrastructure (new facilities and access road, runway, and utilities improvements) would likewise be constructed and installed as part of the Proposed Action. The Undertaking would also include the dredging of an existing channel for enhanced vessel approach purposes. The vessel approach channel, which interfaces with both the Chincoteague Inlet Federal Channel and the Bogues Bay connecting waterways, would initially be used by an assortment of shallow draft manned and unmanned vessels. A variety of additional infrastructure elements and facilities as described below would also be constructed to further support the MARS Port operations.

This Undertaking is the Proposed Action Alternative being analyzed in the EA, along with the No Action Alternative, and consists of the following specific actions (Figures 2-4):

- Channel and turning basin dredging;
- Construction of a new pier for barge access and berthing;
- Construction of a second hangar at the UAS airstrip;
- Installation of new potable and wastewater lines to the hangars (existing and proposed);
- Installation of new of airstrip lighting;
- 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 vehicle parking lot;
- Widening of the existing access road culvert; and
- Construction of a new project support building.

Construction of the dredging and pier elements of the Undertaking would be carried out in three (3) 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 Mean Lower Low Water [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;
- **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 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 11,800 ft-long portion of channel from the Phase 2 turning basin to where it meets with the Chincoteague Inlet Federal Channel.

Although the Undertaking is anticipated to include all three phases of dredging and pier construction, there are two alternative implementations being considered. Under Alternative 1, only Phase 1 of the Undertaking would be implemented, while under Alternative 2, only Phases 1 and 2 would be implemented. The infrastructure and facilities would be constructed regardless of the phases of the dredging and piers construction ultimately implemented.

The elements of the Undertaking are described below in three main groupings: Channel Dredging, Port Components, and Other Infrastructure and Facilities.

Channel Dredging

The Undertaking would include the dredging of an existing channel for enhanced vessel approach purposes. 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 requiring approximately 2 m (8 ft) of draft. The vessel approach channel interfaces with both the Chincoteague Inlet Federal Channel and the Bogues Bay connecting waterways**.** 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; the proposed width of the approach channel (30 m [100-ft]) is consistent with the dimensions of the Federal Channel.

There are five potential sites being evaluated for the placement of dredged material, which are discussed below (Figure 2). Further geotechnical investigation and associated physical and chemical laboratory analysis of sediment samples in the areas to be dredged would be required prior to dredging to determine the viability of the placement sites.

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 miles). Open water placement options typically present the lowest cost dredging option and allows 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 permit would be required for the use of this site.

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. Specifically, there are low lying areas in the vicinity of the culvert crossing 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 the USACE. The 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 miles) 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. The use of this option is unlikely as it currently does not have capacity for additional dredge spoil.

Option 4: Wallops Island Shoreline Protection Placement

This option would involve the beneficial reuse of clean, compatible sand from the dredged material to repair and protect areas of the shoreline within the Operations Range area on Wallops Island. The material would be placed along the seawall to protect the beach from tidal impacts or ocean overwash from coastal storms such as hurricanes and northeasters. 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 11 km (6 nautical miles) 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.

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 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. Once pumped, USFWS would assume responsibility for sediment placement and securing appropriate permits.

Port Components

Planned components of the port include construction of a new pier for barge access and berthing. 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 specifically include the following elements (Figure 3):

- 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 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/deepening.
- The deck height (approximately 3.3 m [11 ft] above waterline) would be above the Flood Protection Elevation as a resiliency measure against predicted Sea-Level Rise (SLR) and surge associated with extreme storm events, as well as meeting future vessel deck requirements.
- The access trestle would be supported by piles designed to span over tidal marshes/wetlands. Pile bents would be spaced on approximate 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.

Other Infrastructure and Facilities

A variety of onshore facilities and infrastructure would be constructed or upgraded to support the port operations, which are briefly summarized below (Figure 4).

Second Hangar

A new, approximately 660-sq m (7,125-square ft) hangar would be constructed 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 client usage. A second, secure hangar would allow for use by MARS port/pier clients without hindering usage of the existing hangar for UAS Airfield operations. Existing electrical and communication utilities at the existing hangar would be extended to the new hangar.

Potable Water and Wastewater Lines to Hangars

Potable water would be supplied from the elevated north end tank (V-090). 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 conduit would be extended from the existing hangar to the proposed hangar at the UAS Airstrip. 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 edges of the runway (one light every 61 m [200 ft]). Lights would only be turned on when required by an airfield operation (i.e., aircraft takeoffs or landings) and turned off when the operation is completed.

Airstrip Access Road Improvements (culvert widening)

A 40-m (130-ft) segment of the existing paved access road would be widened to 9 m (30 ft) to enlarge the culvert for the drainage channels to Cow Gut.

Vehicle Parking Lot

A new parking area with spaces for up to 30 vehicles would be constructed near the northwest intersection of the UAS airstrip access road and runway. This proposed parking lot would occupy approximately 0.75 acres of primarily forested uplands.

Runway Hardening for Port Access

A 30.5-m (100-ft) wide section of runway would be improved (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 access road would be constructed along the north side of the existing UAS airstrip from the intersection with the access road to the new MARS Port pier area.

Project Support Building (i.e., North Island Operations Center)

A new, approximately 740-square meter (sq m) (8,000-square foot [sq ft]) building may be constructed at the general location of the existing Lifesaving Station on the southwest end of the access road to the UAS airstrip. The facility would serve as a new North Island Operations Center. Electrical, potable water, wastewater, and communications utilities would be extended to this facility from existing nearby infrastructure.

Area of Potential Effects and Identification of Historic Properties

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

As described in the 2019 *Final Site-wide PEIS*, in accordance with Sections 106 and 110 of the NHPA, NASA developed a Programmatic Agreement (PA) with the Virginia SHPO and Advisory Council on Historic Preservation to outline how WFF will manage its cultural resources as an integral part of its operations and missions: *Programmatic Agreement Among the National Aeronautics and Space Administration, the Virginia State Historic Preservation Office, and the Advisory Council On Historic Preservation Regarding the Management of Facilities, Infrastructure, and Sites at the National Aeronautics and Space Administration's Wallops Flight Facility, Wallops Island, Accomack County, Virginia* (NASA 2014, 2016).

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 PA. The PA 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

Area of Potential Effects (APE)

The APE, as defined in 36 CFR Part 800.16(d), is "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking."

For this undertaking, the APE has three components: the terrestrial archaeological APE, the marine archaeological APE, and the above-ground APE (Figure 5). NASA has defined the terrestrial archaeological Area of Potential Effects (APE) as the proposed limits of disturbance for the undertaking in upland areas. NASA has defined the marine archaeological APE as the proposed limits of disturbance for the undertaking in marine areas. Due to the low vertical profile of the project elements, NASA has defined the above-ground APE as a 0.8-kilometer (0.5-mile) radius buffer around the proposed limits of disturbance, both terrestrial and marine.

Figure 6 provides a Preliminary APE for the dredge spoil placement locations. Additional environmental and engineering evaluations are necessary to determine the preferred dredge spoil placement location for this undertaking. NASA will consult with DHR once the specific location has been identified.

Identification of Historic Properties

NASA used a combination of existing data review and Phase I archaeological surveys to identify historic properties within the APE. Figure 7 shows resources and previous investigations within the APE for the terrestrial and marine components of the project; Figure 8 shows the resources in the vicinity of the dredge placement options; and Figure 9 shows the locations of the three terrestrial and marine archaeological surveys performed in 2021 as part of identification and evaluation efforts.

The terrestrial elements of the undertaking are located within the boundary of Wallops Island Flight Facility Historic District (DHR ID 001-0027), which was determined Not Eligible for the NRHP on November 4, 2004. This includes seven contributing resources within the Preliminary APE for Dredge Spoil Option 4 (Wallops Island Shoreline Protection Placement) (DHR ID 001-0027-0238, -0239, -0240, -0241, -0242, -0244, and -0251). All seven have been determined Not Eligible for the NRHP. Two additional resources, DHR ID 001-0027-0100 and -0101, are within the APE for the proposed project support building (i.e., North Island Ops Center) and are discussed in more detail, below.

In 2003, NASA modeled all property within WFF's boundaries for the potential of terrestrial archaeological resources, which is depicted in Appendix A of the PA, which is included as Appendix B in the 2015 *Integrated Cultural Resources Management Plan for Wallops Flight Facility* (2015 ICRMP).

Three archaeological surveys are within the broader above-ground APE: AC-039, AC-049, and AC-076. AC-039 represents the Phase I survey for the proposed DD(x) Wetlands Mitigation project, which documented 44AC0459, discussed in more detail, below. AC-049 is a terrestrial portion of the 2009 terrestrial and marine archaeological surveys conducted for the proposed shoreline restoration and infrastructure protection program. AC-076 represents the Phase I survey of a proposed wetland mitigation bank. None of these surveys intersect the terrestrial archaeological APE and none documented archaeological sites within the terrestrial or marine archaeological APE.

According to NASA's predictive model for prehistoric and historic archaeological sites in the 2015 ICRMP, a number of terrestrial portions of the undertaking along the UAS Airstrip site falls within the area of High archaeological potential, specifically the second hangar, the water and wastewater lines, the airstrip lighting, the runway hardening, and the access road to port. During the NEPA analysis for the construction and operation of the UAS Airstrip, NASA performed a Phase I archaeological survey, which included the proposed UAS Airstrip, two hangars, and the access roadway (Chris Espenshade and Kirstie Lockerman, 2009, *Cultural Resources Investigations of the Proposed Uninhabited Aerial Systems Airstrip, Wallops Flight Facility, Accomack County, Virginia*, New South Associates). The survey resulted in the documentation of 44AC0089, a terrestrial earthwork dating to the Revolutionary War and located approximately 60 m (200 ft) northeast of the APE near the UAS Airstrip. This survey encompassed all the aforementioned terrestrial portions of the undertaking except for the second hangar, the proposed location of which was not included in the 2009 survey.

NASA performed a Phase I archaeological survey of the proposed second hangar in 2021. The report of these investigations, *NASA Wallops Flight Facility Phase I Archaeological Survey for the Wallops Island North Development Project, Wallops Island Virginia* by Kathleen Furgerson and Kelsey Johnson, is enclosed with this letter. This Phase I survey did not document any archaeological resources. The rest of the terrestrial archaeological APE near the UAS Airstrip has been previously disturbed as a result of construction of the airstrip.

The remaining terrestrial portions of the undertaking in the vicinity of the existing UAS Airstrip, the airstrip access road improvements and the vehicle parking lot, area within an area of Low archaeological potential (2015 ICRMP). Both are in areas of poorly drained soil; the access road is located on a constructed berm.

The proposed project support building (i.e., North Island Ops Center) will be built in the former location of the Wallops Beach Lifesaving Station (DHR ID 001-0027-0100), which was determined eligible for the NRHP on November 4, 2004. NASA notified DHR of their intent to demolish the Wallops Beach Lifesaving Station in a letter dated February 29, 2016. As mitigation for the adverse effect, the resource was documented via HABS recordation and a documentary video produced (https://vimeo.com/ursci/review/177622715/b2f6e500b2), pursuant to the PA. DHR concurred that NASA met the requirements outlined in the PA and can proceed with demolition in an email dated March 3, 2020.

This location was subjected to archaeological monitoring conducted by Tetra Tech related to lead remediation activities on January 13, 2014. The remediation activities consisted of the removal of approximately 6 inches of soil within a 4,500 square feet area within a 20-foot radius buffer around the foundation of the Wallops Beach Lifesaving Station. The remediation excavations removed the A horizon and allowed the monitoring archaeologist to inspect the exposed subsoil for evidence of cultural features and artifacts. No cultural features or artifacts were revealed during the remediation activities (*Surface Soil Removal, Former Coast Guard Station [Building V-65], NASA Wallops Island, Wallops Island, Virginia, Archaeological Monitoring Field Summary* n.d.). It is not clear if the remediation activities removed additional soil after the conclusion of the archaeological monitoring. While this location is in an area of high archaeological potential (2015 ICRMP), this location has been disturbed by the lead remediation activities, which did not reveal any cultural features or artifacts. Based on the previous disturbance and lack of archaeological remains, no archaeological survey is recommended for this location.

The Wallops Beach Station Observation Tower (DHR ID 001-0027-0101), which is associated with the Wallops Beach Lifesaving Station, is also located adjacent to the proposed North Island Ops Center. The tower is not individually eligible for the NRHP but contributes to the eligibility of the Wallops Beach Lifesaving Station, which is slated for demolition. As the tower is not individually eligible, and as the historic property to which it contributed is slated for demolition and mitigation for this adverse effect has been implemented pursuant to the PA, NASA has determined that Wallops Beach Station Observation Tower is no longer an historic property.

Site 44AC0459 is located adjacent to the proposed North Island Ops Center, which is the former location of the Wallops Beach Lifesaving Station and Observation Tower (DHR ID 001-0027-0100). Site 44AC0459 yielded artifacts from the mid-eighteenth through twentieth century and is associated with the old Coast Guard Station trash disposal patterns and mid-to-late twentieth century NASA activities. According to V-CRIS, the site is unassessed for the NRHP. The site is located outside of the APE.

The marine portions of the undertaking, specifically the port improvements and the navigation channel, extend from the northwestern end of the UAS Airstrip and arc around the northeastern end of Wallops Island before intersecting with the Chincoteague Inlet Channel. The navigation channel already exists; some portions of the channel are not at the necessary depth and would require dredging, while other portions are already at the necessary depth and thus would not require any new dredging.

NASA conducted a Phase I marine archaeological survey in July 2020 and February 2021 for the marine portions of the undertaking, excluding the area of the proposed channel that do not require dredging. Review of nineteenth and early twentieth-century nautical charts and historic maps of the marine APE did not reveal the potential for significant shipwrecks or potentially submerged maritime industry resources. The marine archaeological survey used nonintrusive geophysical instruments including a side scan sonar, a marine magnetometer, and a single-beam sonar and documented 53 magnetic and 9 acoustic contacts. No potentially significant submerged

archaeological resources were identified within the marine APE. No additional archaeological investigations are recommended of any recorded anomalies from the survey. The report of these investigations, *Marine Archaeological Survey for the Wallops Island Northern Development Project, Wallops Flight Facility, Accomack County, Virginia* by Chris Cartellone and Jean B. Pelletier, is enclosed with this letter.

The five proposed dredge spoil placement locations are located in the vicinity of MARS Port; some are in marine locations (i.e., Option 1, Option 3) and some are in terrestrial or mixed terrestrial/marine locations (i.e., Option 2, Option 4, Option 5).

No known archaeological sites are located within the Wallops Island Open Ocean Placement (Option 1); according to V-CRIS, this location has not been subject to a Phase I archaeological survey. The exact location of the Wallops Island Flood Protection/Upland Placement (Option 2) is currently not known. Generally, though, the location is within an area of Low archaeological potential (2015 ICRMP). It is also within the boundary of DHR ID 001-0027, determined not eligible for the NRHP.

No known archaeological sites are located within the Greenbackville Dredged Material Containment Facility (Option 3); according to V-CRIS, this location has not been subject to a Phase I archaeological survey. Two above-ground resources are in the vicinity of Option 3. DHR ID 001-0028 is the Franklin City Railroad Station, and DHR ID 001-5053is a house at 2937 Franklin City Road. Neither resource has been evaluated for NRHP eligibility.

The exact location of the Wallops Island Shoreline Protection Placement (Option 4) is not known, but it is generally along the shoreline of Wallops Island. It is in the vicinity of DHR ID 001-0027 and a number of contributing resources, all of which have been determined not eligible for the NRHP.

The Chincoteague National Wildlife Refuge Swan Cove Placement (Option 5) is in the vicinity of Little Toms Cove and Swan Cove Pool. Terrestrial portions of Option 5 are within previous archaeological survey AC-015, a 1988 archaeological reconnaissance of Chincoteague National Wildlife Refuge. A number of other previous archaeological surveys have been conducted immediately adjacent to or in the immediate vicinity of Option 5 (AC-007, AC-034, AC-083, AC-089, and AC-093). One previously recorded archaeological site, 44AC0412, is directly adjacent to Option 5 on the west side of Beach Road. The site is the remains of an early twentieth century life saving station and is unassessed for NRHP eligibility.

Determination of Effect

No archaeological historic properties are located within the APE. The Phase I archaeological survey of the proposed hangar and the Phase I marine archaeological survey did not identify any archaeological resources within the APE, and previously recorded sites 44AC0089 and 44AC0459 are located outside of the APE. No above-ground historic properties were identified within the APE.

NASA concludes that there would be "no historic properties affected" by the proposed undertaking. Your concurrence with this determination is respectfully requested.

It is understood that this determination excludes the dredge spoil placement locations. Additional environmental and engineering evaluations are necessary to determine the preferred dredge spoil placement location for this undertaking. NASA will consult with DHR once this location has been identified.

If you have any questions or require additional information, please contact me at Randall.M.Stanley@nasa.gov or (757) 824-1309.

Sincerely,

RANDAL
L
STANLEY

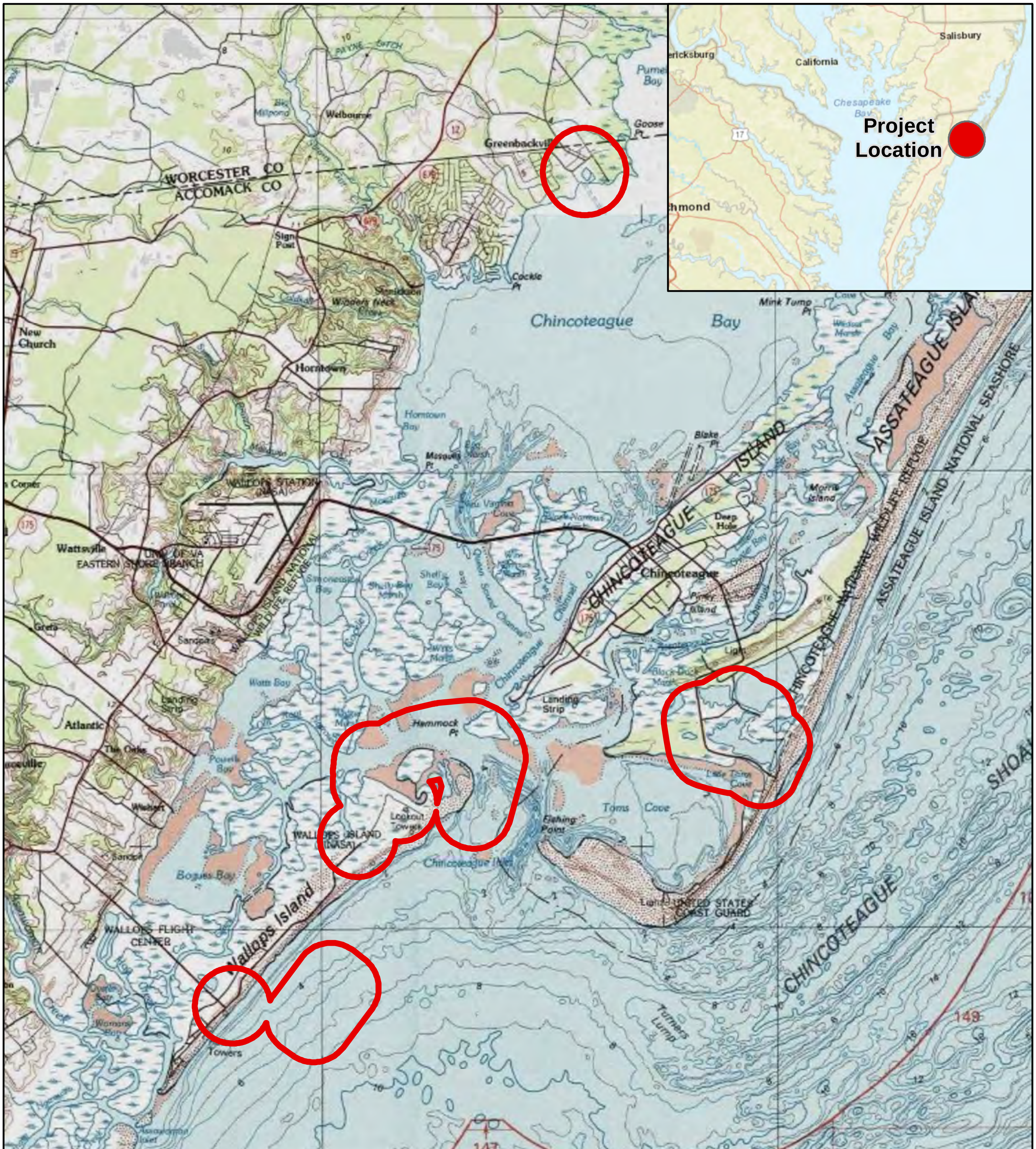
Digitally signed by: RANDALL STANLEY
DN: CN = RANDALL STANLEY C = US O = U.S. Government OU = NASA, People
Date: 2021.09.10 10:44:26 -05'00'

Randall M. Stanley
Cultural Resources Manager

3 Enclosures

- -Figures 1-9
- -*NASA Wallops Flight Facility, Phase I Archaeological Survey for the Wallops Island North Development Project, Wallops Island, Virginia by Kathleen Furgerson and Kelsey Johnson* (2021)
- -*Marine Archaeological Survey for the Wallops Island Northern Development Project, Wallops Flight Facility, Accomack County, Virginia* by Chris Cartellone and Jean B. Pelletier (2021)

cc:
250/Ms. S. Miller
VCSFA/Mr. N. Overby



Legend

Project APE

N

0 1 2 3 Miles

0 1 2 3 4 5 Kilometers

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12420 Milestone Center Dr.
Germantown, MD 20876

Project Location

Source: Esri 2021

Project No.	Prepared by	Date	
60662622	KAF	07/23/21	Figure 1

Legend

Dredge Spoil Option

AECOM 12420 Milestone Center Dr. Germantown, MD 20876

Dredge Option Components

Source: Esri 2021

Project No.	Prepared by	Date	
60662622	KAF	07/23/21	Figure 2

Legend

- Phase I Pier
- Phase II Pier
- Phase I Eastern Toes
- Phase II and III Basin Toes
- West Alternate Toes
- Federal Channel
- Exisiting Fiber Optic Cable

N

0 500 1,000 Feet

0 100 200 300 Meters

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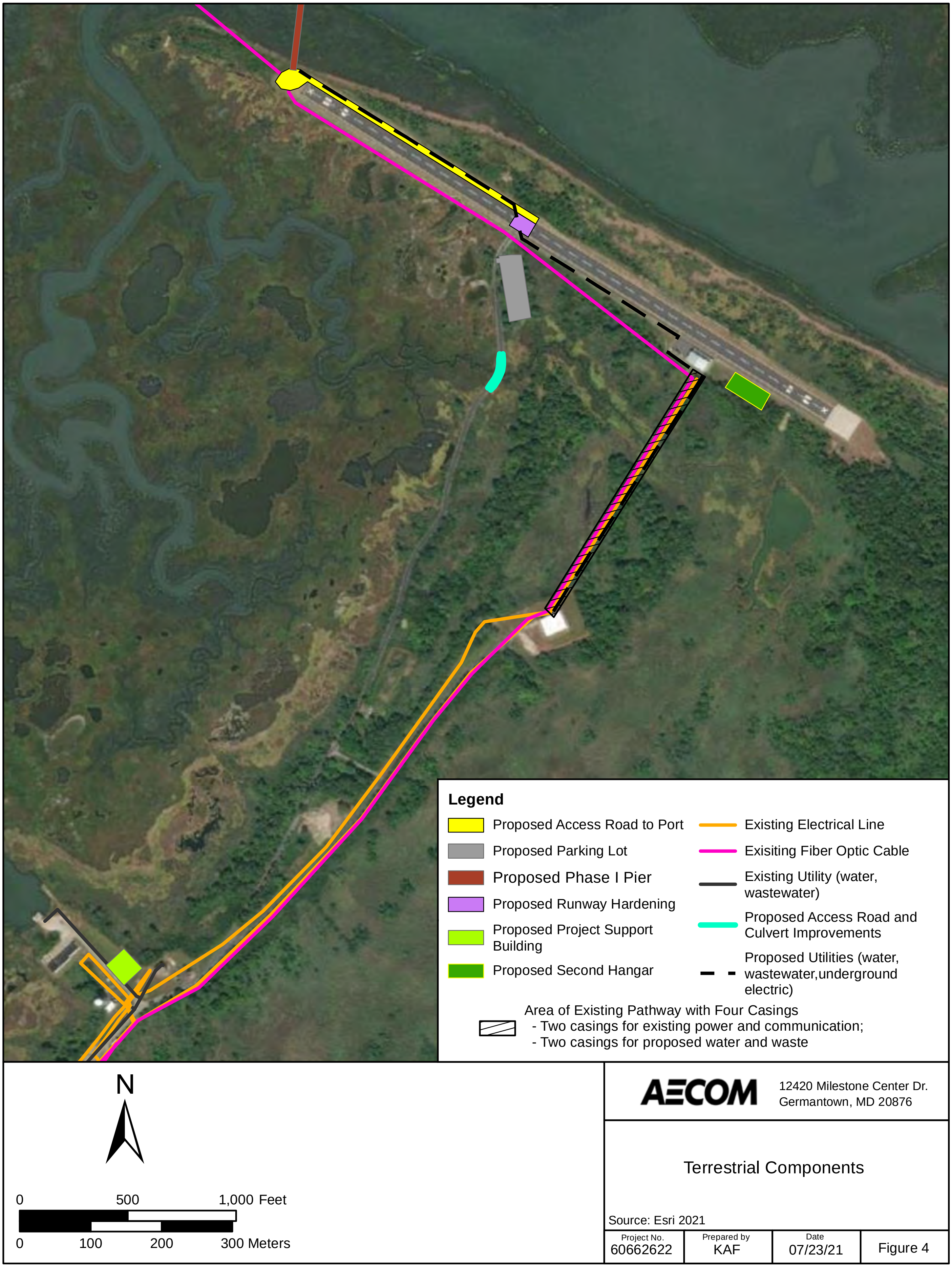
Marine Project Components

Source: Esri 2021

Project No.	Prepared by	Date	
60662622	KAF	07/23/21	Figure 3



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Terrestrial Components

Source: Esri 2021

Project No.	Prepared by	Date	
60662622	KAF	07/23/21	Figure 4

Legend

- Marine Archaeology APE
- Terrestrial Archaeology APE
- Above-Ground APE

N

0 1,000 2,000 Feet

0 200 400 600 Meters

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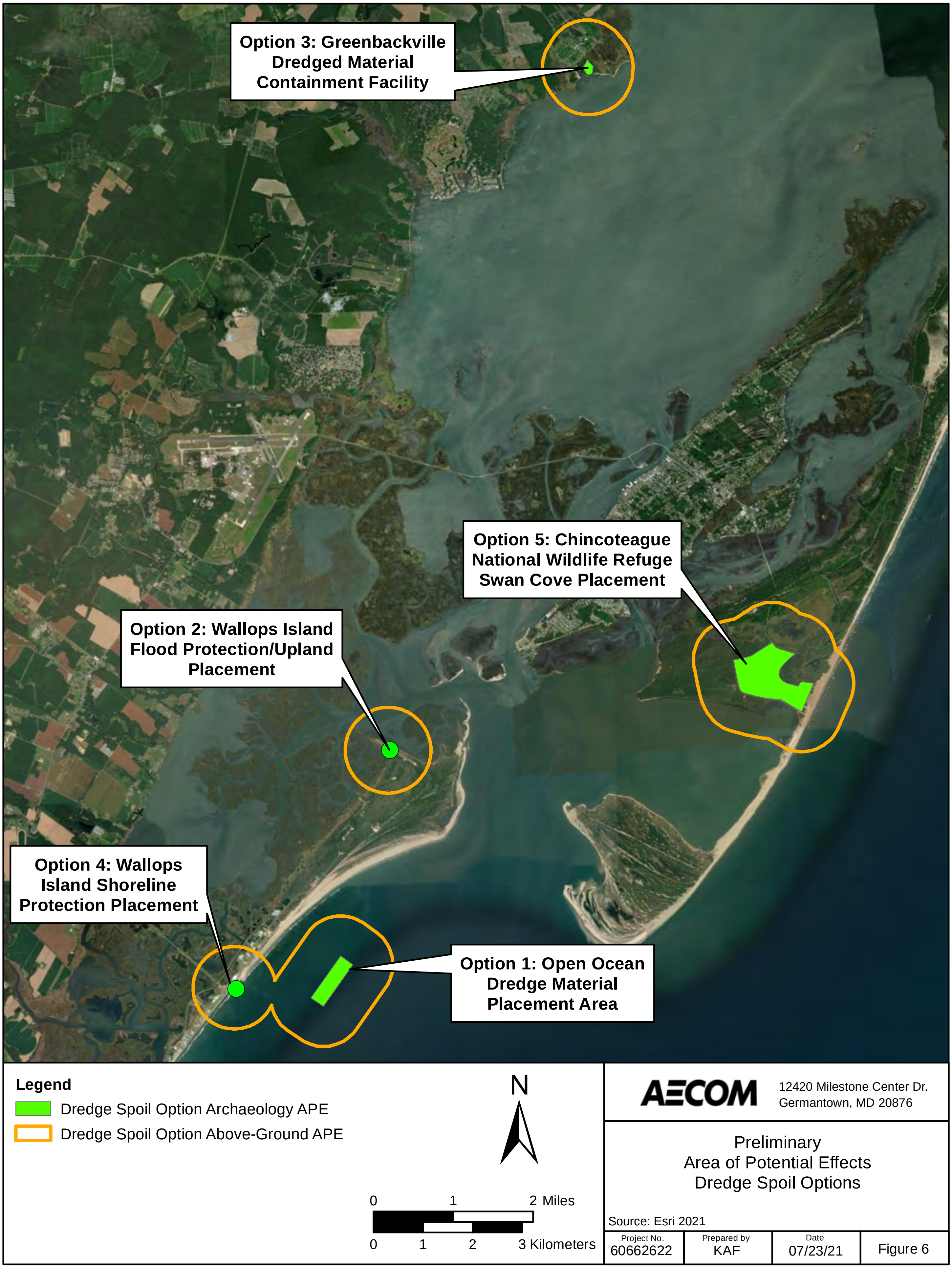
Area of Potential Effects

Source: Esri 2021

Project No.	Prepared by	Date	
60662622	KAF	07/23/21	Figure 5



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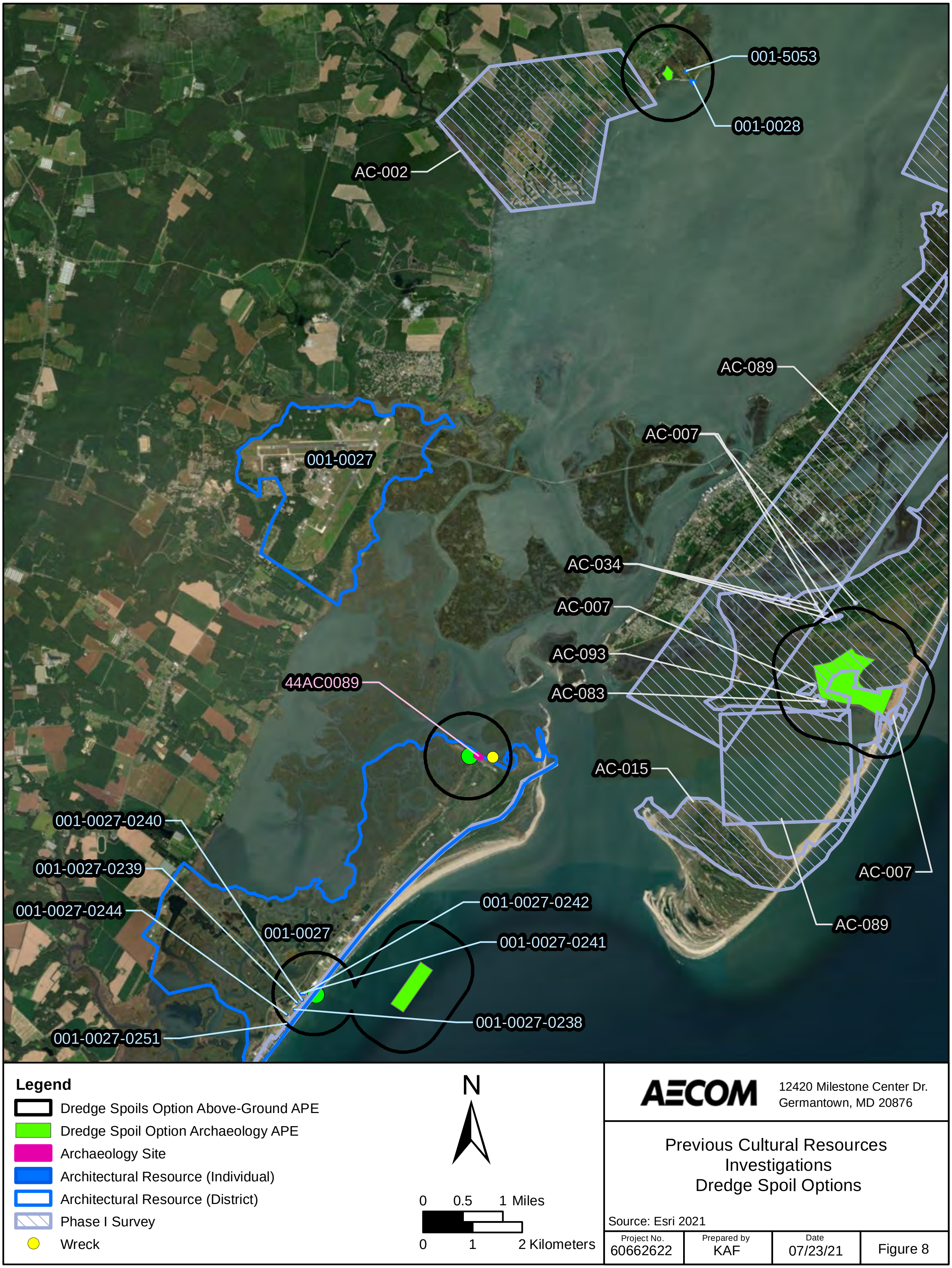
Preliminary
Area of Potential Effects
Dredge Spoil Options

Source: Esri 2021

Project No.	Prepared by	Date	
60662622	KAF	07/23/21	Figure 6



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Previous Cultural Resources Investigations
Dredge Spoil Options

Source: Esri 2021

Project No.	Prepared by	Date	
60662622	KAF	07/23/21	Figure 8

Legend

- Above-Ground APE
- Marine Archaeology APE
- Terrestrial Archaeology APE
- Phase I Survey
- Archaeology Site
- Architectural Resource (Individual)
- Architectural Resource (District)
- Unidentified Wreck

N

0 1,000 2,000 Feet

0 200 400 600 Meters

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Previous Cultural Resources Investigations

Source: Esri 2021; V-CRIS 2021

Project No.	Prepared by	Date	
60662622	KAF	07/23/21	Figure 7

Legend

- Current Above-Ground APE
- Current Marine Archaeology APE
- Current Terrestrial Archaeology APE
- Marine Phase I Survey - 2020
- Marine Phase I Survey -2021
- Terrestrial Phase I Survey - 2021

N

0 1,000 2,000 Feet

0 200 400 600 Meters

AECOM

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Current Cultural Resources Investigations

Source: Esri 2021

Project No.	Prepared by	Date	
60662622	KAF	07/23/21	Figure 9

COMMONWEALTH of VIRGINIA

Department of Historic Resources

2801 Kensington Avenue, Richmond, Virginia 23221

Ann Jennings
Secretary of Natural and Historic Resources

Julie V. Langan
Director

Tel: (804) 367-2323
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MEMORANDUM

DATE: 15 October 2021 **DHR File #** 2021-4540

TO: Mr. Randall Stanley
NASA

FROM: Marc E. Holma, Architectural Historian (804) 482-6090
Review and Compliance Division

PROJECT: NASA Wallops Flight Facility (WFF) – Wallops Island Northern Development (WIND), Accomack County

_X_ This project will have an effect on historic resources. Based on the information provided, the effect will not be adverse.

____ This project will have an adverse effect on historic properties. Further consultation with DHR is needed under Section 106 of the NHPA.

____ Additional information is needed before we will be able to determine the effect of the project on historic resources. **Please see below.**

____ No further identification efforts are warranted. No historic properties will be affected by the project. Should unidentified historic properties be discovered during implementation of the project, please notify DHR.

____ We have previously reviewed this project. Attached is a copy of our correspondence.

____ Other (Please see comments below)

COMMENTS: