Little Wicomico River Navigation Maintenance Dredging and Beneficial Use Design Report

Shoreline Studies Program
Virginia Institute of Marine Science
William & Mary

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Prepared for the Northern Neck Planning District Commission

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Executive Summary

Project overview.

The Little Wicomico River in Northumberland County, Virginia, provides important public access to the Potomac River and Chesapeake Bay. The river supports marinas and many personal and commercial boats. Jetties constructed at the river mouth interrupt longshore sediment transport from the Potomac River, promoting the accumulation of sediment within and adjacent to the navigation channel. Over time, this sediment has formed extensive shoals at the river entrance, restricting navigable depths, reducing boating access, and diminishing the value of this public resource.

Why this matters.

Shoaling is not unique to the Little Wicomico River. Regional studies of the Northern Neck waterways show many shallow-draft channels are partially restricted or fully shoaled, creating safety concerns and constraining local maritime economies. When channels cannot be maintained, impacts can ripple outward: reduced boating safety and access, reduced recreational and commercial activity, and potential reductions in shoreline property values and local tax revenues.

What this project did.

This effort is a design and planning phase—it does not include dredging or construction. The work produced a package to support future permitting, funding, and implementation. Key tasks completed include:

1. Updated bathymetric surveys and modeling to measure current shoaling and calculate dredging needs.
2. Sediment sampling and testing to determine whether dredged material is clean and suitable for beneficial reuse.
3. Environmental and fisheries review to identify sensitive resources and likely regulatory considerations.
4. Concept-level dredge and placement design, along with planning-level cost estimates and a useful-life estimate.

What's proposed for the federal navigation channel?

Little Wicomico River's federally authorized channel dates to 1935 and is authorized to be 150 ft wide and -8 ft Mean Lower Low Water (MLLW). An additional 2 ft of allowable overdepth is being permitted, resulting in a maximum dredge depth of -10 ft MLW. Surveys completed in November 2024 show shoaling concentrated near the river mouth. Based on sediment characteristics and navigational requirements, dredging is proposed for the first 2,600 ft of the channel extending landward from the Potomac River entrance to restore navigable depths.

Approximately 22,700 cubic yards of sandy sediment within the proposed dredge reach lie above the -10 ft MLW dredge template and are proposed for dredging and beneficial use.

Beneficial use: using clean sand to help protect an eroding shoreline.

Testing shows the material towards the mouth of the channel is predominantly clean sand (about 94%), which is suitable for shoreline placement. The inner channel contains more silt and clay and remains deep enough (-9 ft MLW) to not dredge this area for the current dredge cycle. The project proposes a beneficial use strategy: place the dredged sand along the eroding shoreline south of the channel mouth, where erosion has been ongoing for decades and has accelerated near the southern jetty (reported shoreline change ranging from roughly -0.2 to -2.5 ft per year, depending on location). The concept design would place sand along roughly 900 ft of shoreline separated by an existing breakwater system, overall creating a stabilized beach/berm system and planting vegetation to help hold the material in place.

Environmental considerations and protections.

Chemical testing of representative sediment samples found no contaminants above detection limits for a wide range of regulated compounds (metals, petroleum-related compounds, pesticides/PCBs, and others), supporting suitability for shoreline placement.

The project area does not overlap mapped submerged aquatic vegetation (SAV) beds, but the channel does cross two private oyster leases.

Potential impacts to bottom-dwelling organisms (benthos) from dredging are expected to be temporary, with recolonization typical in estuarine environments.

Federally listed species that may occur in the broader area include Atlantic Sturgeon, Green Sea Turtle, Hawksbill Sea Turtle, Northeastern Beach Tiger Beetle, Kemp's Ridley Sea Turtle, and the West Indian manatee. Future construction scheduling and best practices would be used to minimize risk (for example, time-of-year restrictions if required by regulators).

Costs and expected maintenance interval.

A planning-level cost estimate for dredging and beneficial placement of approximately 22,700 cubic yards is about $1.43 million, including design/permitting, mobilization/demobilization, dredging, and placement. Based on historic dredging cycles and observed infill patterns, the channel's useful life following dredging is estimated at 5-8 years, though the river mouth is expected to refill first and may require maintenance sooner.

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Acronyms

BUDM – Beneficial Use of Dredged Material
C.Y. / CY – Cubic Yards
D50 – Median Grain Size (particle diameter at which 50% of the sample is finer)
DEM – Digital elevation model
DEQ – Virginia Department of Environmental Quality
EPA – Environmental Protection Agency
ESA – Endangered Species Act
FWS – United States Fish & Wildlife Service
GPS – Global Positioning System
ITM - Inland Testing Manual
JPA – Joint Permit Application
LDPSA – Laser Diffraction Particle Analyzer
MLW – Mean low water
MLLW – Mean lower low water
NAD83 – North American Datum of 1983
RCRA – Resource Conservation and Recovery Act
RRS – Regulatory Request System
SAV – Submerged aquatic vegetation
TOY – Time of year
USACE – U.S. Army Corps of Engineers
VGIN – Virginia Geographic Information Network
VIMS – Virginia Institute of Marine Science
VMRC – Virginia Marine Resource Commission

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1 Introduction

The Northern Neck Peninsula of Virginia is characterized by a complex, interconnected network of shallow-draft navigation channels, working waterfronts, and ecologically sensitive estuarine habitats. Little Wicomico River is located in Northumberland County, Virginia (Figure 1) and empties at the confluence of the Potomac River and Chesapeake Bay, near the Maryland-Virginia boundary. The geographical configuration of the Little Wicomico River is characterized by a narrow mouth, stabilized by two stone jetties located on the north and south of the channel, as well as a timber bulkhead extending from the northern jetty (U.S. Army Corps of Engineers, 2016). North of the channel is an undeveloped spit, and a developed residential spit is to the south. This area is an active working waterfront that supports residential, recreational, and commercial maritime activities (Milligan et al., 2023).

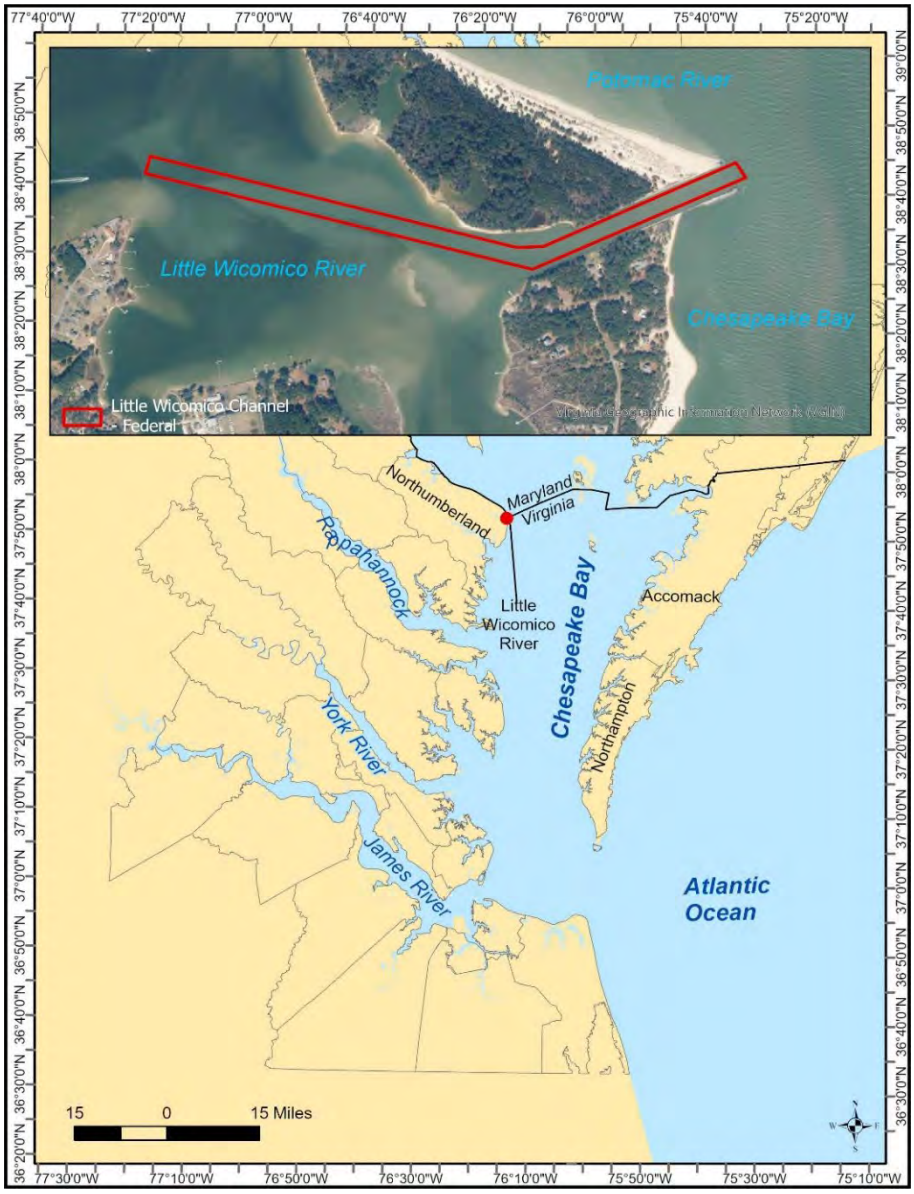

Figure 1. Location of the Little Wicomico River within the Chesapeake Bay estuarine system.

1.1 Regional Coastal Infrastructure Context

Little Wicomico River was one of the five waterbodies selected from phases one and two of the Northern Neck Regional Shallow Draft Channel Dredging Plan. The primary goal of these phases was to analyze all waterbodies in the Northern Neck region to determine five waterbodies in need of dredging based on physical parameters and residential and economic usage. In the Feasibility Phase (Phase 2), more detailed site data were collected on 19 waterbodies to provide additional data to localities for consideration. Five waterbodies were selected from this list for the development of comprehensive, technically sound maintenance dredging designs.

The Little Wicomico River is a key access point for recreational boating and commercial seafood harvesting, providing direct water access to the Chesapeake Bay. Many of the river's navigational challenges stem from disruptions to natural sediment transport processes at the river mouth. Jetties constructed at the entrance interrupt the dominant southward littoral sediment transport pathway along the Potomac River shoreline, creating a depositional environment at the inlet. Sediment that bypasses and overtops the jetties accumulates within the entrance channel, resulting in chronic shoaling, reduced navigable depths, and impaired access for recreational and commercial vessels.

Milligan et al. (2024) explain this localized shoaling within a broader regional context. The report identified 142 shallow-draft channels within the Northern Neck region. The spatial analysis revealed that 7 waterbodies were completely shoaled, and 36 had more than 50% shoaling.

Figure 2. Reported vessel grounding incidents at the mouth of the Little Wicomico River are associated with shoaling conditions (Smith Point Sea Rescue, 2024).

The Little Wicomico River was categorized as experiencing more than 50% shoaling, resulting in many boats getting

stuck at the mouth of the channel. The consistent shoaling at the mouth has also been documented through local user observations, including reports from a volunteer-based marine assistance organization, Smith Point Sea Rescue (Figure 2). These reports indicate an increased frequency of vessel groundings at the mouth of the Little Wicomico River and highlight the need for local government involvement to address ongoing shoaling conditions.

This research underscores the extent of shoaling that has occurred over time and highlights the urgent necessity for a proactive, systemic approach to dredging. Restoring navigability to historic levels is paramount to providing the safe and expedient marine transit required to support the region's marine-based economies. If these navigable waterways are not maintained, boating safety will be jeopardized, resulting in the loss of recreational and economic use. Possible economic impacts include reduced regional economic activity, depreciated shoreline property values, and subsequently fewer real estate tax revenues flowing to local governments.

1.2 Project Goals

This phase (Phase 3) of the project focused exclusively on engineering analysis, environmental evaluation, sediment characterization, and preparation of conceptual design plans necessary to support future permitting and construction activities. No construction or dredging activities were proposed as part of this effort.

The central objective of the design phase was to define the channel template required to restore authorized dimensions of 150 ft in width and -8 ft Mean Low Water (MLW). An additional 2 ft of allowable overdepth is being permitted, resulting in a maximum dredge depth of -10 ft MLW. Completion of updated bathymetric surveys, digital elevation modeling, volume calculations, and cross-sectional analyses to quantify dredging needs and support accurate cost estimating was included in this phase.

Another key goal was to evaluate the physical and chemical characteristics of channel sediments to determine suitability for beneficial use. Through sediment core analysis and chemical testing, the project documented that dredged materials are appropriate for shoreline placement, thereby informing a preliminary beneficial use strategy for future implementation.

The design phase also aimed to assess natural resources and regulatory considerations associated with the proposed maintenance dredging. This included a review of benthic communities, fisheries resources, threatened and endangered species, submerged aquatic vegetation, shellfish resources, and potential time-of-year restrictions. These evaluations ensured that future project implementation can proceed in compliance with applicable federal and state regulations. The project also produced planning-level cost estimates and useful life projections to support funding decisions and long-term maintenance planning. By completing a thorough and defensible design package, this phase positions the project sponsor to pursue permits, secure funding, and advance to construction when resources become available.

2 Federal Navigation Project Authorization & Previous Projects

The federal obligation to maintain the navigability of the Little Wicomico River dates back over three-quarters of a century to the River and Harbor Act of August 30th, 1935, which officially authorized the Little Wicomico River Federal Navigation Project (Milligan et al., 2023). The authorized depth was established at -8 ft Mean Low Water (MLW). The channel spans 150 ft in width and extends approximately 4,800 ft in length from Chesapeake Bay into the river's interior.

Historically, maintaining this infrastructure has required periodic, large-scale dredging campaigns. Records indicate that the Little Wicomico River was dredged on at least three separate occasions between its authorization and the present: 1984, 2003, and 2014. During the 1984 dredging event, 15,000 cubic yards (cy) of material were dredged and placed north of the river along the shoreline for beach and dune development (Figure 3). In 2003, maintenance dredging was conducted to achieve a channel depth of -8 ft MLW, including 2 ft of advanced maintenance and 1 ft of allowable overdepth (U.S. Army Corps of Engineers,

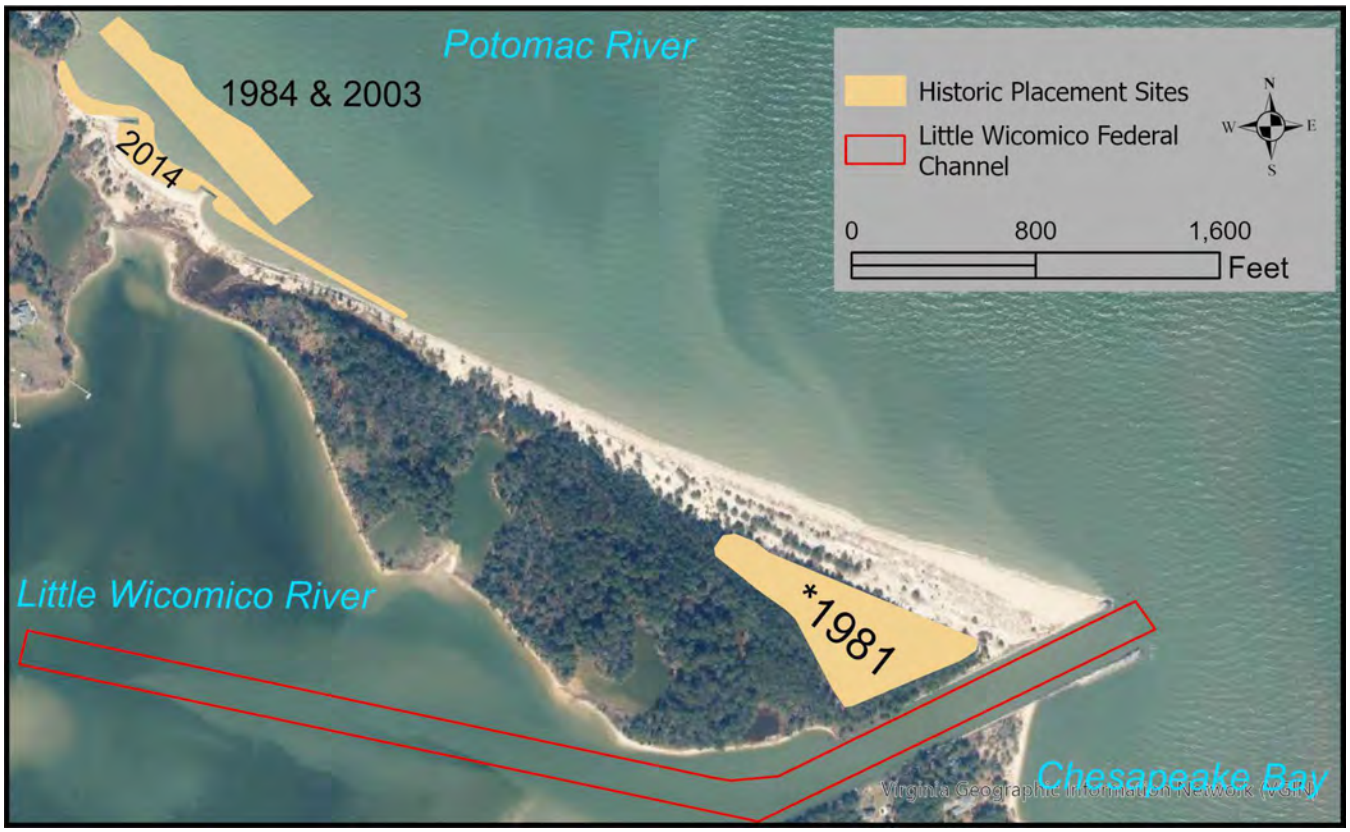

*Figure 3. Placement areas from previous dredging cycles at the Little Wicomico River. Note, some of this information comes from older records and/or permit data, so actual placement areas may vary. *This site was considered during the 1981 permitting process for the 1984 dredge project.*

Baltimore District, 2007). The project removed 43,700 cy of material and placed it at the same site used for the 1984 dredging. Maintenance dredging was performed again in 2014 at the outermost 1,100 ft of the channel, to the same controlling depth as in 2003. About 12,000 cy of material was dredged and placed in the same area, with material positioned farther landward to account for shoreline retreat over time (U.S. Army Corps of Engineers, 2013).

3 Bathymetric Survey, Spatial Model, and Volume Analysis

To accurately quantify the volume of accumulated material and engineer a dredge template, channel condition surveys were taken by licensed hydrographic surveyors from Waterway Surveys & Engineering Ltd in November 2024 (Figure 4). Data was collected both inside and outside the river along the Federal channel, and far enough seaward to reach the channel design depth in the natural system. Soundings were taken using a multi-beam sonar system operating at 400 kilohertz, and a real-time kinematic global positioning system was used to obtain horizontal positions. All spatial coordinates were projected in US Survey Feet and referenced to the Virginia State Plane coordinate system (South Zone), utilizing the North American Datum of 1983 (NAD83, Epoch 2010). Horizontal references were converted to UTM, Zone 18N, NAD83. Vertical soundings were collected in MLLW at Little Wicomico River based on the National Tidal Datum Epoch of 1983-2001. The Little Wicomico River has a mean tide range of 1.1 ft. The conversion from MLLW to MLW is 0.1 ft.

Following field data collection, the raw acoustic point-cloud data were imported into Esri ArcPro. To model the highly variable benthic terrain, a vector-based Triangular Irregular Network (TIN) surface was algorithmically generated. The TIN model constructs a continuous,

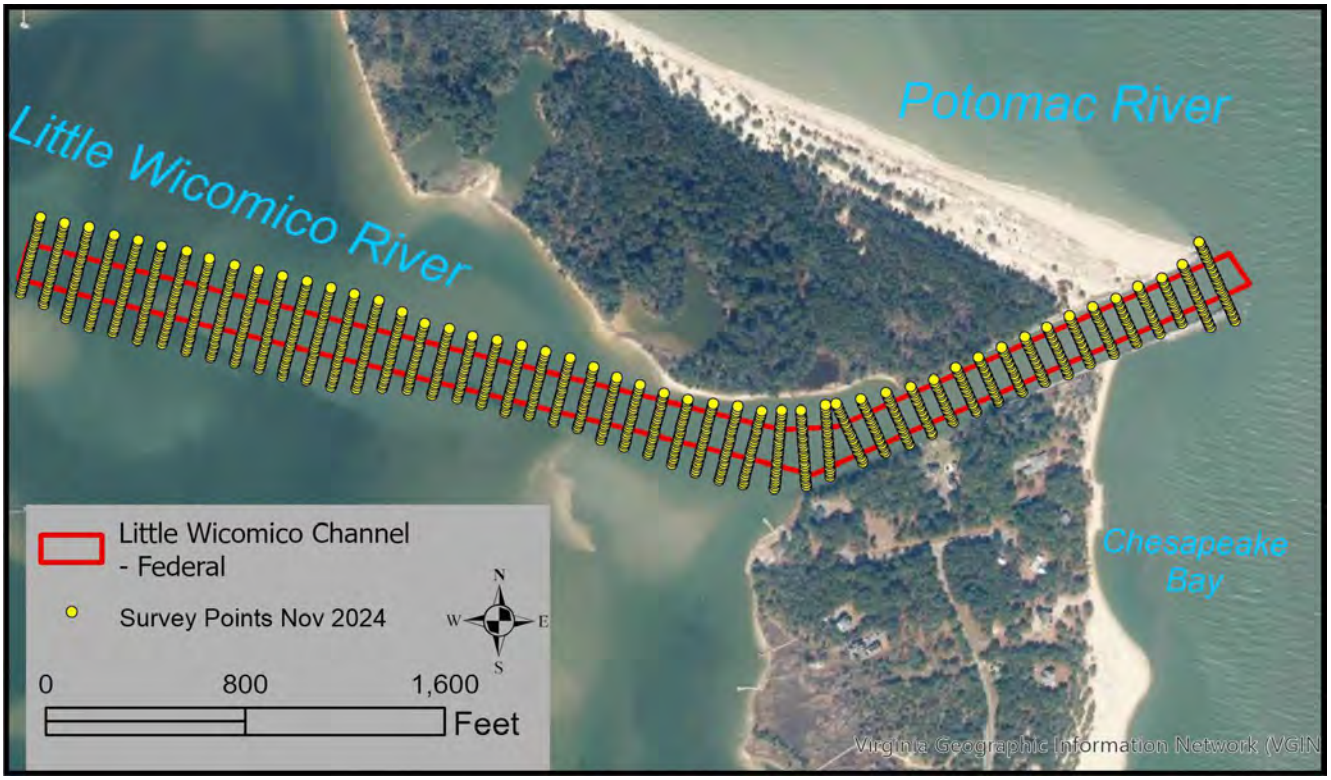

Figure 4. Survey points were taken for this project in the federal channel.

unbroken surface of non-overlapping triangular facets. From this highly accurate TIN, a raster-based Digital Elevation Model (DEM) was rendered utilizing a 3-foot grid cell size (Figure 5). This DEM serves as a three-dimensional computer graphics model, using color-coded ramps to represent bathymetry in feet relative to the MLW datum. The DEM was used to calculate the exact amount of material that requires removal during the dredging phase.

By establishing a baseline DEM of the existing shoaled bathymetry and spatially overlaying a geometric model of the authorized channel design (-8 ft MLW plus 2 ft overdepth), a differential subtraction was performed. The DEM analysis indicates that approximately 35,900 cubic yards of sedimentary material occur above the -10 ft contour for the entire channel. This shoaling is heavily concentrated near the river mouth and the bend, where sediment accumulation has significantly restricted navigation and created a substantial blockage of the entrance channel. Given the concentration of shoaled material at the channel entrance and much of the inner channel is deeper than -8 ft MLW, dredging is proposed for the first 2,588 ft of the channel extending landward from the Potomac River. DEM analysis of this reach indicated that approximately 22,700 cubic yards of sediment lie above the -10 ft MLW dredge depth and would require removal to restore navigable conditions (Table 1). Only the outer-channel sandy sediments (22,700 CY) are proposed for dredging and beneficial use; the inner-channel muddy sediments are not proposed for dredging under the current design.

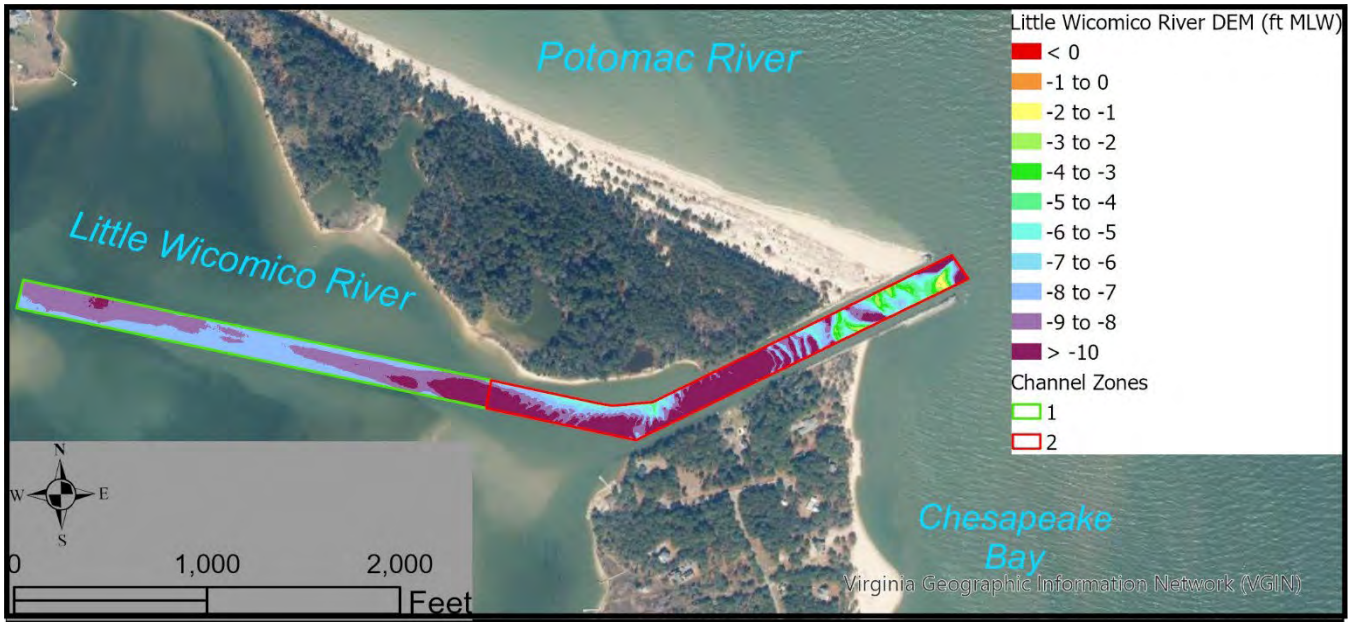

Figure 5. Bathymetric DEM created from the survey data.

Table 1. Summary of dredging characteristics for the federal navigation channel and proposed dredge project.

Item	Entire Federal Channel	Proposed 2026 Dredge Project
Length	4,800 ft	2,588 ft
Proposed max depth	-10 ft MLW	-10 ft MLW
Analysis volume	35,900 cy	22,700 cy
Sediment type	Mixed with mud in the interior channel and the sandy outer channel	Predominantly sand
Proposed for dredging	No	Yes

4 Geotechnical Investigation and Physical Sediment Characterization

Being able to use dredged material for structural shoreline restoration is contingent on the material's grain size characteristics. Material intended for beach nourishment must possess specific geotechnical properties. A geotechnical analysis provided a sediment profile through direct sampling and testing of the benthic material. VIMS collected 5 sediment cores ranging from 5 to 8 ft long (cores #1-4, 8) and 3 short samples (#5-7) at 2 ft each throughout the federal channel (Figure 6). The presence of very coarse sediment deposits where samples 5-7 were taken prevented successful vibracore penetration, resulting in the collection of only the top two ft of material that did not have its stratigraphy maintained similar to a grab sample.

The cores were retrieved using standard vibracoring techniques to preserve stratigraphic integrity and were transported to VIMS for processing. Each core was split and cut into sections to make the cores more manageable when processing. The cores were photographed (Appendix A) and visually logged (Appendix B) by a VIMS laboratory technician. Core and grab sample descriptions included observations of sediment angularity, sorting, and sediment color documented using the Munsell Soil Color Chart.

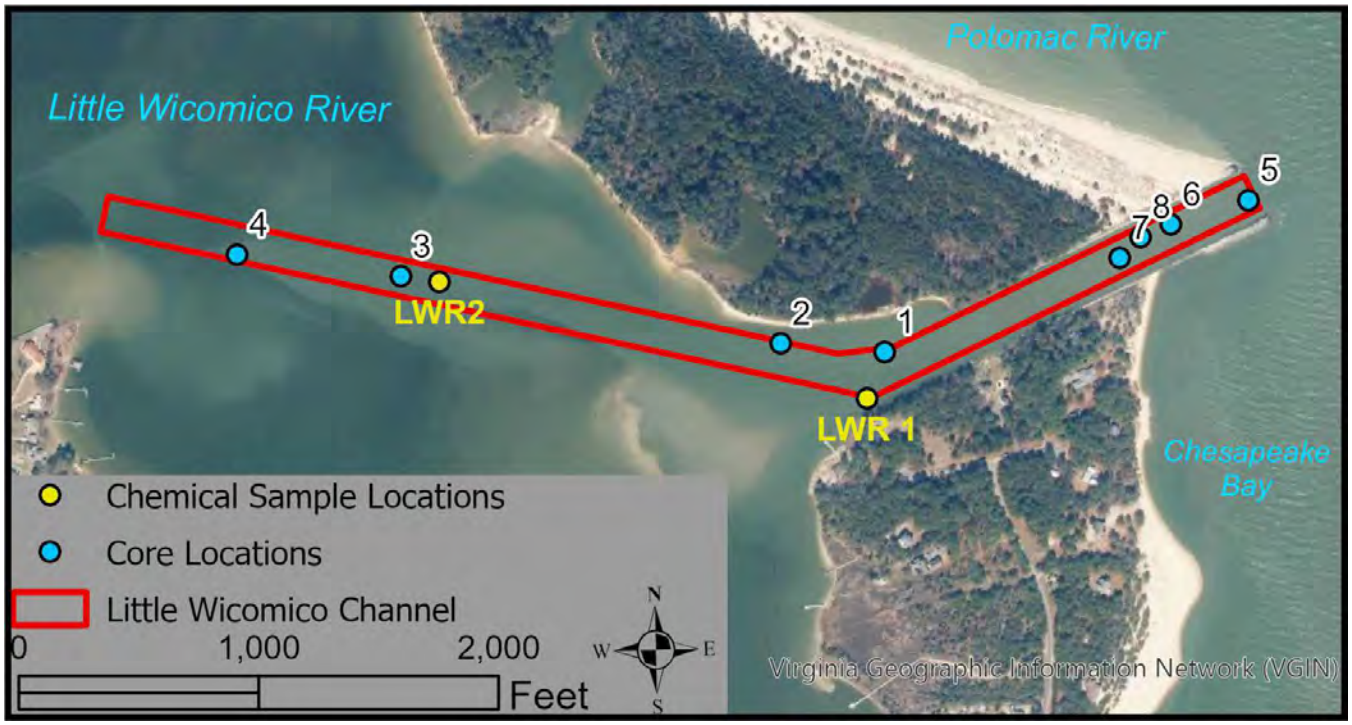

Figure 6. Location of sediment cores (blue), and sediment samples analyzed for chemicals (yellow) in the channel.

Following the core descriptions, sediment subsamples were collected at each observed lithologic change within the core. Subsample intervals generally range from 4 to 6 in. The subsamples were weighed in their wet state and then placed in a drying oven for a minimum of 24 hours to ensure all moisture was removed. After drying, the samples were then reweighed to determine water content. The dried samples were hand-sieved using 1 and 2 phi screens to separate coarse-grained particles from fine-grained particles. The coarse-grained sediment samples were weighed and calculated separately. The dried, fine-grained samples were separately placed in a dispersing solvent for a minimum of 24 hours to promote particle separation in preparation for grain size analysis using the Laser Diffraction Particle Analyzer (LDPSA).

Following dispersion, sediment samples were analyzed using the Laser Diffraction Particle Size Analysis (LDPSA) to characterize the fine-grained fraction. LDPSA results were used to determine the D50 (mm) and relative proportions of gravel, sand, silt, and clay-sized material located above the proposed dredge depth (Table 2). Grain-size data were calculated for each core using material above –10 ft MLW, and a thickness-weighted mean was computed to represent the overall sediment composition of the channel (Appendix C). Grain size fractions were defined according to the Wentworth (1922) scale. Textural classification of bulk sediment samples was determined using the Shepard (1954) ternary diagram based on relative proportions of sand, silt, and clay.

Two sediment samples were collected from the proposed placement area, one at the most recent high-water line and the other at the toe of the beach. These samples were analyzed using the same laboratory methods applied to the channel sediment cores. Grain-size analysis indicates that sediments along the shoreline are relatively coarse and are generally comparable to the proposed dredged material (Table 2).

Sediment analysis of cores and grab samples taken in the channel shows that the material in the outer channel, identified by cores 1 and 2, and 5-8, contains 94% sandy sediment to be placed along the shoreline. The percentage of fines in cores 1 and 2, and 5-8 in samples taken above -10 ft MLW varies from 0-5%. The D50 for the section of the cores included in the -10 ft MLW dredge were 0.33 mm (core 1), 0.2 mm (core 2), 0.68 mm (core 5), 0.75 mm (core 6), 0.56 mm (core 7), and 0.59 mm (core 8). Beach nourishment minimum grain size requirements typically require that the D_{50} be no less than about 0.25 mm. Though

Core 2 is only 0.2 mm, when included in the weighted average with the other cores, which are much coarser, the overall compatibility exceeds the requirement. Cores 3 and 4 are in the inner channel and have a higher percentage of fines at 20 and 55%, respectively, and do not qualify for shoreline placement. The D_{50} values for sediments within the proposed -10 ft MLW dredge prism are 0.02 mm for Core 3 and 0.1 mm for Core 4. To maximize the beneficial use of dredged material, dredging is proposed only within the sandy sediments located at the front of the channel, where sediment characteristics are compatible with shoreline placement.

Table 2. Mean weighted (to -10 ft MLW) grain size analysis of cores, grab samples, and placement sediment samples.

Sample_ID	% Gravel	% Sand	% Silt	% Clay	% Mud	D50 (mm)
Core 1	0	99	1	0	1	0.33
Core 2	0	95	4	1	5	0.20
Core 3^	0	43	52	5	57	0.02
Core 4^	0	78	20	2	22	0.10
Core 5	10	89	0	0	0	0.68
Core 6	5	94	0	0	0	0.75
Core 7	1	99	0	0	0	0.56
Core 8	21	78	0	0	0	0.59
Placement HWL	0	100	0	0	0	1.08
Placement TOE	0.02	98	0	0	0	1.50

^Sediment is not being used for shore placement.

5 Chemical Characterization and Ecotoxicity Screening

In addition to grain size testing, any sediment proposed for shoreline placement is subject to toxicological analysis. The regulatory framework governing this process is outlined in the Evaluation of Dredged Material Proposed for Discharge in the Waters of the U.S. Testing Manual, a protocol developed jointly by the Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (USACE), commonly referred to as the "Inland Testing Manual (ITM)". The purpose of the ITM is to establish standardized procedures to evaluate potential contaminant-related environmental impacts associated with dredged material discharges in inland and near-coastal waters (U.S. Environmental Protection Agency [EPA] & U.S. Army Corps of Engineers [USACE], 1998).

The ITM has a progressive, tiered approach to determining testing requirements. Tier I is an initial evaluation based entirely on existing information, including previously collected physical, chemical, or biological data, as well as an assessment of potential contamination pathways. Because the Little Wicomico River sediment is overwhelmingly composed of inert, large-grained sand (94%) and lacks proximity to industrial point sources, fuel facilities, or heavy commercial pollution pathways, it successfully met the Tier I criteria. The physical nature of sediment is inherently protective; large-grained sands are resistant to absorbing heavy metals or complex hydrocarbons. Consequently, the Tier I evaluation concluded that there was "no reason to believe" that the placement of the dredged material would inflict an adverse environmental impact.

However, due to the proposed placement along private shorelines, the project advanced to Tier II chemical evaluations to provide additional empirical confirmation. On September 3, 2025, two additional bottom sediment samples (labeled LWR1 and LWR2 on Figure 6) were collected specifically for chemical testing, one situated at the midpoint of the channel, and the other at the back of the defined channel. An auger was utilized for data collection, which was meticulously decontaminated with Liquinox detergent and distilled water between each sample to prevent cross-contamination. The sediment was scooped using stainless-steel implements into sterile glass containers provided by Enthalpy Analytical and immediately preserved in coolers maintained below 43°F.

The samples underwent laboratory analysis at Enthalpy Analytical in Richmond, Virginia, utilizing highly calibrated EPA TCLP testing methodologies to evaluate potentially hazardous waste characteristics. The analysis screened for a vast array of potential anthropogenic pollutants (Table 3), and the results are shown in Appendix D.

The comprehensive laboratory results from Enthalpy Analytical confirmed that neither sample location contained contaminants at levels exceeding the Toxicity Characteristic Leaching Procedure (TCLP) test limits. Every heavy metal, from arsenic (<0.100 mg/L) to mercury (<0.008 mg/L), registered well below thresholds. Similarly, volatile organic compounds, often associated with marine fuel spills, such as benzene (<5.00 ug/kg) and toluene (<5.00 ug/kg), were absent. All analytes were either not detected or were present below laboratory reporting limits.

Table 3. Summary of ecotoxicity and chemical testing parameters.

Chemical Parameter Category	Notable Analytes Tested	Result Summary	Potential Sources
TCLP Volatile Organic Compounds (VOCs)	Benzene, Toluene, Ethylbenzene, Xylenes (BTEX), Chloroform, Vinyl chloride	Below Detection Limits	Petroleum products (fuel spills, boat engines, marinas), leaking underground storage tanks, industrial solvents, chlorinated drinking water byproducts (chloroform), plastic and PVC manufacturing (vinyl chloride).
Volatile Organic Compounds (GC)	Methyl-tert-butyl ether (MTBE), m+p-Xylenes, o-Xylene	Below Detection Limits	Gasoline additives (MTBE), fuel combustion byproducts, recreational and commercial vessel fueling activities, and stormwater runoff from developed areas.
Semi-volatile Hydrocarbons (GC)	Total Petroleum Hydrocarbons – Diesel Range Organics (TPH-DRO)	Below Detection Limits	Diesel fuel spills, hydraulic fluids, vessel maintenance operations, roadway runoff, and atmospheric deposition from combustion sources.
TCLP Semivolatile Organics (GCMS)	2,4,5-Trichlorophenol, Hexachlorobenzene, Pyridine, Cresol	Below Detection Limits	Wood preservatives, historical pesticide use, coal tar derivatives, petroleum refining byproducts, and industrial chemical manufacturing.
TCLP Organochlorine Herbicides	2,4-D, 2,4,5-TP (Silvex)	Below Detection Limits	Agricultural runoff, roadside and utility right-of-way vegetation management, and historical herbicide applications.
TCLP Organochlorine Pesticides / PCBs	Chlordane, Endrin, Heptachlor, Lindane, Toxaphene, Aroclor 1016	Below Detection Limits	Legacy agricultural pesticide applications, termite treatments, industrial equipment (PCBs in transformers and hydraulic fluids), and atmospheric deposition from historical use.
TCLP Metals	Arsenic, Barium, Cadmium, Chromium, Lead, Selenium, Silver, Mercury	Below Detection Limits	Natural background soils, treated lumber, antifouling paints, historical fuel additives (lead), industrial discharges, stormwater runoff, and atmospheric deposition.

6 Ecological Impacts, Benthic Communities, and Fisheries Management

6.1 Benthic and Fisheries Assessment

Little Wicomico River is in the mesohaline salinity zone (5 to 18 ppt) on the mid Bay, just south of the mouth of the Potomac River. The benthic communities around the Bay and its watersheds have been assessed using the Index of Biological Integrity. This index ranks the relative value of bottom communities around the Chesapeake Bay by comparing values of key benthic community attributes ("metrics") to reference values expected under non-degraded conditions in similar habitat types. It is therefore a measure of deviation from reference conditions. Overall, mid Bay had moderate ecosystem health (C) in 2024 (EcoHealth, 2025). The area's Overall Health Index declined between 2023 and 2024, ending an upward trend that began in 2020. Nitrogen and benthic community scores declined significantly between 2023 and 2024, while aquatic grasses and phosphorus scores increased slightly. Mid Bay was classified as poor (20% to <39%) on the benthic IBI scale (EcoHealth, 2025).

The Chesapeake Bay experiences annual periods of seasonal hypoxia, where dissolved oxygen concentrations drop below 2 mg O2 per liter, and anoxia, where dissolved oxygen concentrations drop below 0.2 mg O2 per liter, during the summer due to a variety of anthropogenic and meteorological factors (Testa et al., 2017). Areas experiencing seasonal hypoxia can see reductions in macrobenthic production as high as 85%. During these hypoxic periods, mobile, non-hypoxia-resistant benthic fauna migrate out of the area, and sessile fauna decrease or stop all non-respiratory activity, leaving the majority of macrobenthic production to hypoxia-resistant species (Sturdivant et al., 2013). The primary hypoxia-resistant bivalve in this area of the Bay contributing to macrobenthic production is the Baltic clam (*Macoma petalum*, formerly *Limecola balthica*). However, despite its hypoxia resistance, hypoxic conditions can still cause up to a 40% reduction in Baltic clam fecundity, and in extreme cases, lead to local population extinctions (Long et al., 2014).

The abundance and distribution of juvenile fish are monitored as indicators of ecologically important finfish stocks. Recent VIMS seine surveys of the Virginia portion of the Chesapeake Bay found that levels of juvenile commercially and recreationally valued striped bass (*Morone saxatilis*) were significantly lower than historical averages (1980-2009). The same survey found that levels of juvenile alewife (*Alosa pseudoharengus*), spot (*Leiostomus*

xanthurus), Atlantic silverside (*Menidia menidia*), and white perch (*Morone americana*) were lower than historical averages. Levels of juvenile blueback herring (*Alosa aestivalis*), banded killifish (*Fundulus diaphanus*), and mummichogs (*Fundulus heteroclitus*) remained within historical averages. However, levels of juvenile American shad (*Alosa sapidissima*) in the Rappahannock River were greater than historical averages, continuing a three-year upward trend, while levels elsewhere in the Bay remained within historical averages (Buchanan et al., 2025).

Schloesser and Fabrizio (2019) found that a particular area or habitat type may disproportionately support juveniles of one species due to the influence of spatially varying environmental factors, which ultimately reveal spatial patterns. The estimation of habitat suitability for each forage species includes consideration of environmental and physical conditions (e.g., distance to shore, percent fine sediment).

Dredging impacts on fisheries are a concern that has been evaluated and researched by the Army Corps of Engineers over the years. Motile forms of biota should be able to avoid the dredging operation; as such, most fish will not be impacted. The main potential impact is by entrainment of the species in the hydraulic dredging operation itself. The proposed project would result in the temporary destruction of marine habitat and the associated benthos in the channel. For bivalves, larval stage impacts have been reported. However, after dredging, repopulation of benthic organisms within the dredging will begin quickly (Newell et al., 1998). In estuaries, communities are well adapted to rapid recolonization of deposits because they are typically subject to frequent natural disturbances. Rates of recovery vary from 6-8 months in estuarine muds, and possibly 2-3 years in sand and gravel habitats.

Permitting agencies can invoke a time of year (TOY) restriction on dredging when species are migrating and/or overwintering. In addition, deeper dredging projects will limit the frequency and duration of impacts over time, because additional cycles of dredging may not be needed. In general, this project will not cause long-term adverse effects on the surrounding ecosystem. Any effect on the environment should be minimal and offset by the project's benefits of maintaining safe navigation and commerce.

Currently, the Little Wicomico River channel contains three private oyster leases (Figure 7) and a Potomac River Fisheries Commission public oyster ground (VMRC, 2025). However,

the proposed project shortens the channel so only two private leases are crossed, and public grounds are not included. No SAV occurs at the site (VIMS, 2026).

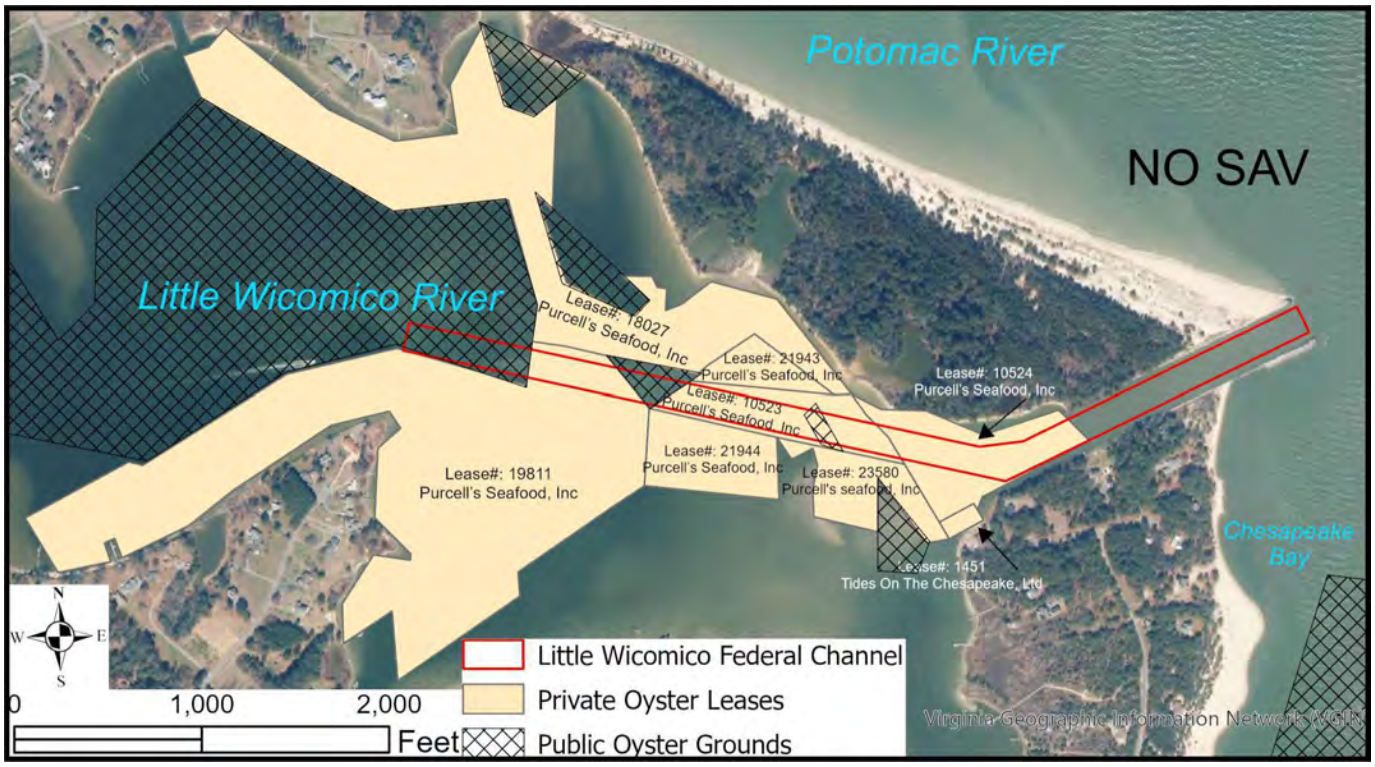

Figure 7. Marine resources in the vicinity of the Little Wicomico River.

6.2 Threatened and Endangered Species

Six species considered federally threatened or endangered may be present in this area of coastal Virginia: The Atlantic sturgeon (Acipenser oxyrinchus oxyrinchus), the green sea turtle (*Chelonia mydas*), the hawksbill sea turtle (*Eretmochelys imbricata*), the northeastern beach tiger beetle (*Habroscelimorpha dorsalis dorsalis*), the Kemp's ridley sea turtle (*Lepidochelys kempii*), and the West Indian manatee (Trichechus manatus). Another federally endangered species of significant concern in coastal Virginia, the northern long-eared bat (*Myotis septentrionalis*), is currently not recognized by the U.S. Fish & Wildlife Service to be found in the area of the Little Wicomico River (FWS, 2025a) (Appendix E).

The Atlantic sturgeon is a federally endangered fish species found all along the East Coast from Florida to Canada. It is an anadromous species, meaning that it spends most of its adult life in the ocean and migrates upriver to spawn in freshwater in the spring and early summer (FWS, 2025b). In the mid Bay, Atlantic sturgeon can be found from the river mouth upriver as far as the fall line near Fredericksburg, Virginia, in the Rappahannock River, and

from the river mouth upriver as far as the Potomac River Dam in Potomac, Maryland (NOAA Fisheries, 2025). The Chesapeake Bay distinct population segment (DPS) was listed as endangered under the Endangered Species Act (ESA) in 2012, along with three other DPSs (FWS, 2025b). The primary threats to Atlantic sturgeon are fishing bycatch, habitat degradation, habitat impediments, and vessel strikes (NOAA Fisheries, 2025).

The green sea turtle is a federally threatened reptile species found along the east coast from Florida to Maryland and is highly migratory. In the Chesapeake Bay, green sea turtles can be found as far north as the mouth of the Potomac River, where they can be observed feeding on seagrass during the summer and fall months before migrating south to warmer waters for the winter. The primary threats to green sea turtles include pollution, fishing bycatch, and habitat loss (FWS, 2025c).

The hawksbill sea turtle is a federally endangered reptile species found along the east coast from Florida to Maine and are highly migratory. In the Chesapeake Bay, hawksbill sea turtles may be found as far north as the mouth of the Potomac River (FWS, 2025d), though they are extremely rare. Since 1979, only two verified sightings of hawksbill sea turtles have been documented in the Bay, and each time was considered to be a stray individual (VIMS, 2025). The primary threats to hawksbill sea turtles include pollution, fishing bycatch, and habitat loss (FWS, 2025d).

The northeastern beach tiger beetle is a federally threatened insect species found along the Mid-Atlantic coast from Virginia to New Jersey. In the Chesapeake Bay, they can be found on wide, fine-sediment sandy beaches with little to no organic content, where they prey on smaller invertebrates and scavenge detritus. Critical habitat areas in the Bay are found at Plum Tree Island National Wildlife Refuge and the Eastern Shore of Virginia National Wildlife Refuge. The primary threats to northeastern beach tiger beetles are pollution and habitat loss/degradation (FWS, 2025e).

The Kemp's ridley sea turtle is a federally endangered reptile species found along the east coast from Florida to Canada, and is highly migratory. They are a common sight in the Chesapeake Bay in the summer and fall months as far north as the mouth of the Potomac River, where they can be observed feeding on mollusks and crustaceans before migrating south

to warmer waters in the winter. The primary threats to Kemp's ridley sea turtles include pollution, fishing bycatch, and habitat loss (FWS, 2025f).

The West Indian manatee is a federally threatened marine mammal species native to coastal Florida. In warmer months, manatees may be found as far west as coastal Texas and as far north as Delaware Bay (FWS, 2025g). However, manatees are unable to survive in waters colder than 68 ˚F and must return to the warmer Florida waters to overwinter. Because of this, manatees are rarely found in Chesapeake Bay aside from the occasional lone individual (Beck et al., 2011). The primary threats to manatees include vessel strikes, entanglement in fishing gear and other debris, habitat loss, cold snaps, and red tides (FWS, 2025g).

7 Channel Design and Placement Strategy

7.1 Channel Design

The proposed dredge prism encompasses the entrance portion of the channel, extending approximately 2,588 ft in length and 150 ft in width, for a total footprint of approximately 385,700 sq ft. The river is primarily influenced by tidal exchange. To maintain the federally authorized depth of -8 ft MLW, and an additional 2 ft of overdepth allowance (total dredge cut depth -10ft MLW), approximately 22,700 cy of material will be hydraulically or mechanically dredged and placed along the shoreline for beneficial use (Table 4). The mouth of the channel and the north side, where the channel bends, have the highest deposit of sediment that needs to be dredged. The calculated DEM depicts the volume amounts using color. Sections of the channel where less material needs to be removed are shown in green, while sections needing significant dredging are shown in red. Areas deeper than -10 ft are blank because no material needs to be dredged in that section of the channel (Figure 8).

The nature of channel dredging and maintenance can be seen in the core logs and depositional patterns. Typical channel cross-sections show the change in the existing bottom resulting from dredging (Figures 9 & 10). Profile B crosses the inner channel, where the channel remains at -9 ft MLW. Little to no dredging is needed in this part of the channel and it was left out of the dredge extent for this project to meet sediment requirements for shoreline placement. Profile C shows a profile in the middle of the channel where sediment is accreted from the north as a shoal and fills in the channel. Dredging will expand its width and depth where needed. Profiles D and E show that the entire channel is shoaling; this area will need the most dredging. Profile F is outside of the federal channel and shows that dredge depths can be met.

Table 4. Estimated sediment volumes within the inner (mud) and outer (sand) channel zones above the -9 ft and -10 ft MLW dredge templates.

Max Dredge Cut Depth (ft MLW)	Zone	Sediment Type	Volume of Material (cy)
-9	Inner Channel	Mud	2,800
-9	Outer Channel	Sand	14,800
		Total	**17,600**
-10	Inner Channel	Mud	13,200
-10	Outer Channel	Sand	22,700
		Total	**35,900**

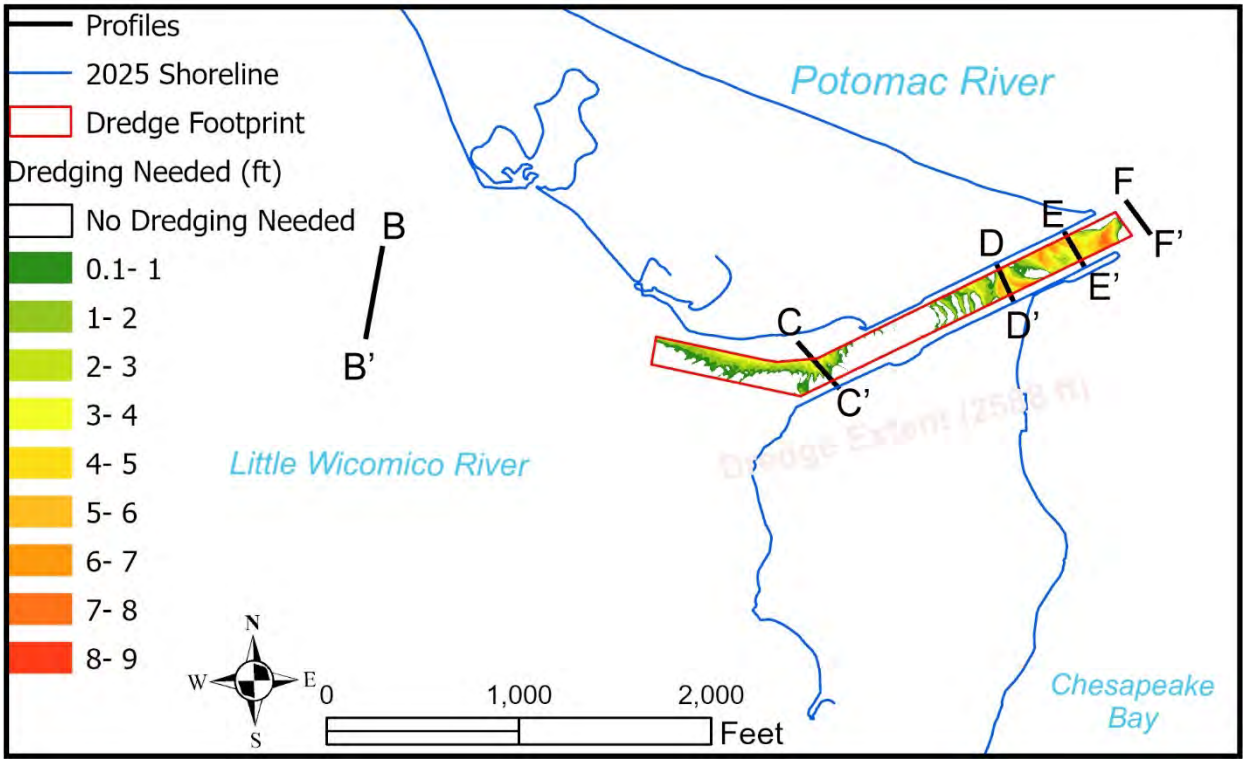

Figure 8. Depth of dredge cut needed within the channel.

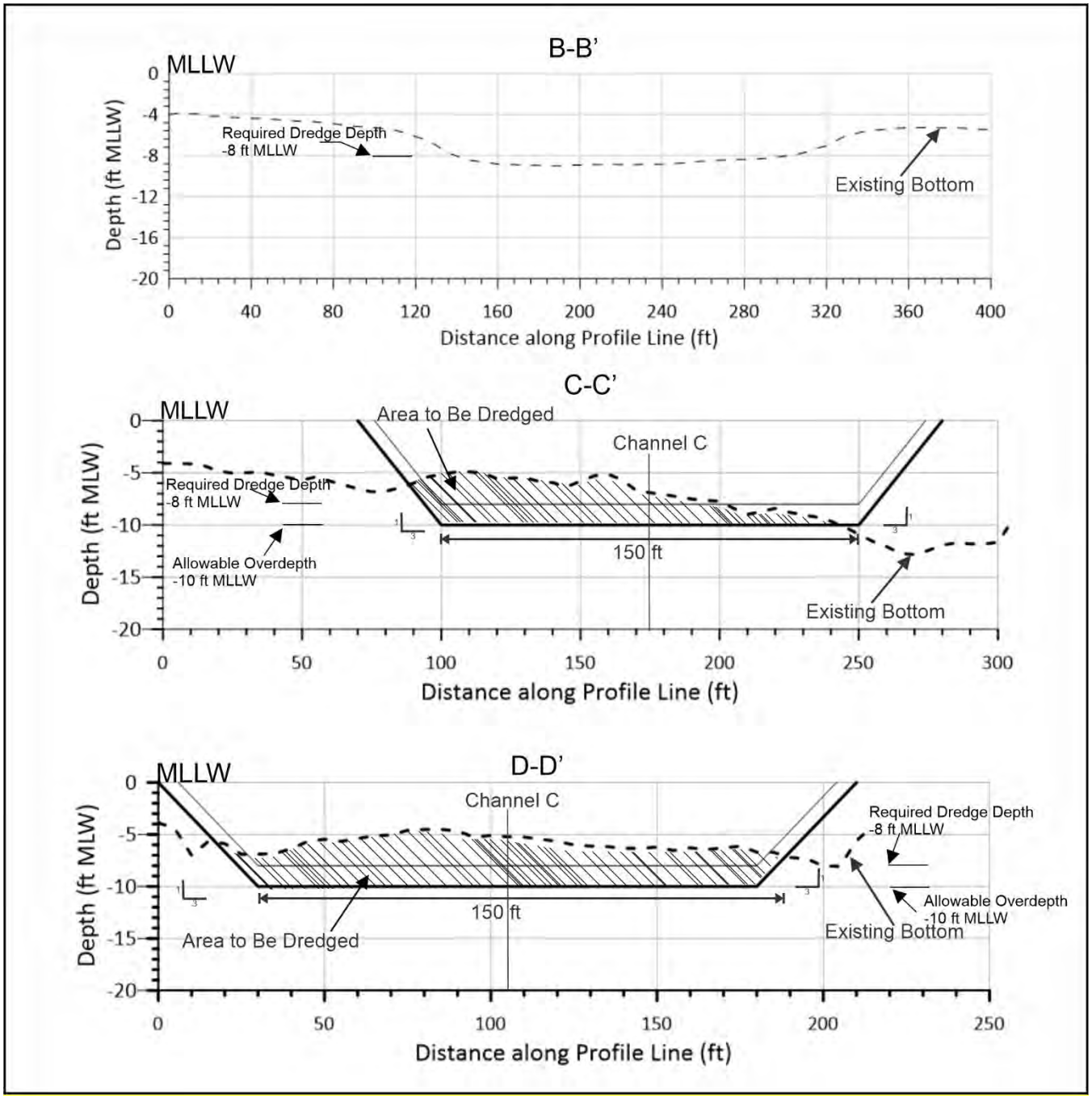

Figure 9. Typical cross-sections of the channel showing the area that needs dredging. Cross-sections are shown in Figure 8.

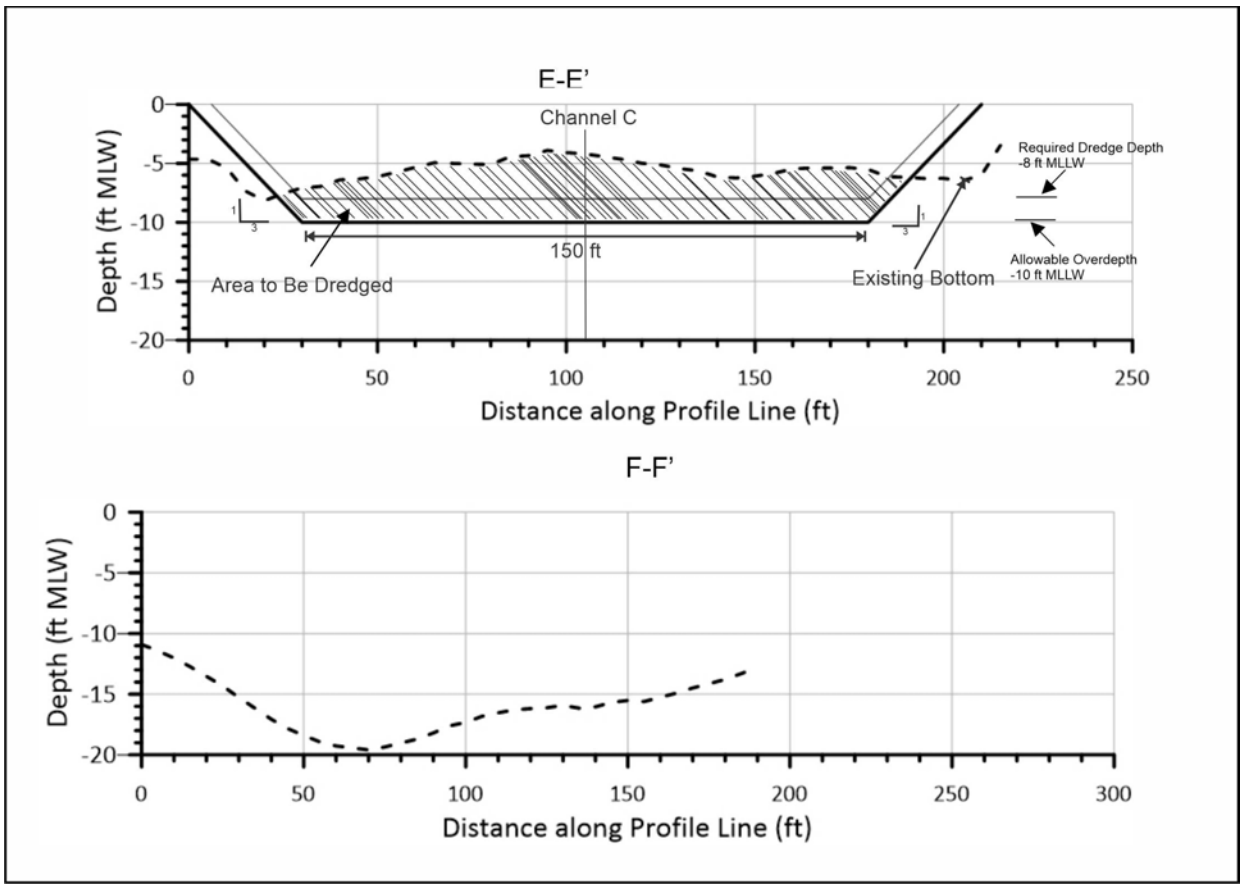

Figure 10. Typical cross-sections of the channel showing the area that needs dredging. Cross-sections are shown in Figure 8.

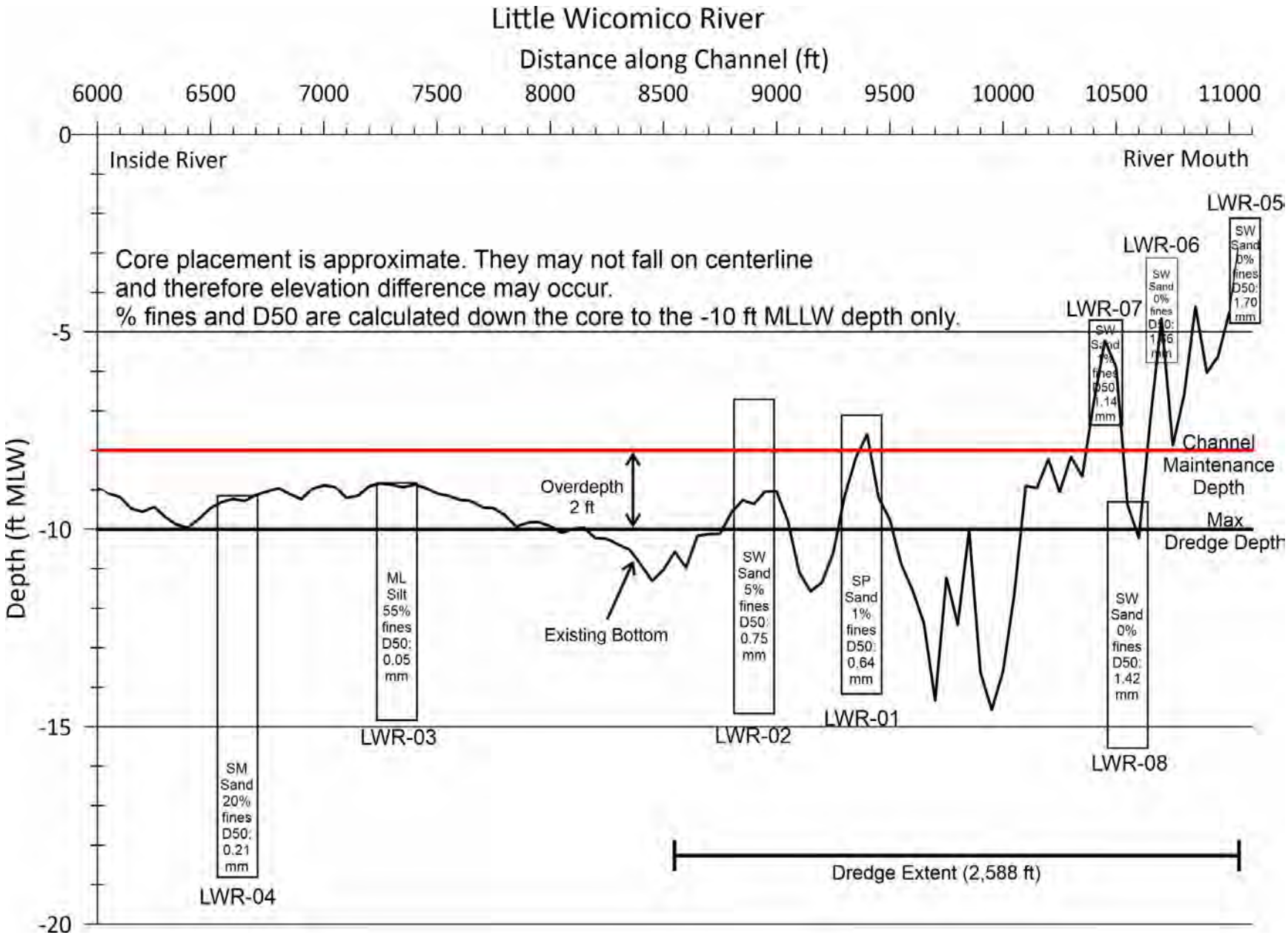

Figure 11. Centerline federal channel depths are shown with the cores that were taken in the channel.

7.2 Beneficial Use of Dredged Material (BUDM) Placement Strategy

Historically, dredged sediments were often viewed as waste material requiring costly disposal and transported via barges to open water disposal sites or pumped into upland containment facilities. However, the paradigm of modern coastal engineering has fundamentally shifted. Clean, sandy sediment is recognized as a highly valuable, finite resource essential for habitat restoration, shoreline stabilization, and proactive climate resilience against sea-level rise.

To determine where the placement of the sandy material would best serve a regional view of sand resources, shoreline change was analyzed at previous placement sites and along the adjacent shorelines. In the 2003 and 2014 dredging projects, sandy material was placed about 1 mile upriver along the Potomac at an eroding site that had broken through to the Little Wicomico River (Figure 3). In addition to the sediment, headland breakwaters were placed along this shoreline. The addition of structures and sand stabilized this upriver shoreline, so other areas that needed sand were prioritized in the proposed placement site analysis. When determining where to place sediment for this dredge project, it was noted that the present shoreline south of the jetty had eroded nearly back to the 1937 position. The jetties at the Little Wicomico River tend to stop the natural flow of sediment down the Potomac River, around Smith Point, and onto the shoreline south of the jetties.

The shoreline change south of the jetties was calculated for the period 1953–2025 to assess the influence of storm events and relative sea-level rise over the past 72 years (Figure 12). Shoreline erosion rates ranged from approximately -0.2 to -2.5 ft/yr. The segment immediately adjacent to the southern jetty exhibits medium erosion rates, which decrease to approximately -0.5 ft/yr in the vicinity of the breakwaters. The breakwater system spans approximately 200 ft of shoreline and is characterized by minimal accretion. South of the breakwater system, erosion rates are reduced, ranging from -0.2 to -1.5 ft/yr.

The Little Wicomico River sits at a transition zone where both the Potomac River and the Chesapeake Bay influence coastal processes, creating complex morphodynamics. Alongshore transport from the Potomac River interacts with increased wave energy from the Bay, enhancing sediment transport. However, the jetties prevent the placement area from receiving sufficient sediment, resulting in significant erosion. As a result, it was determined

that placing the dredged material from the Little Wicomico River along the eroding shoreline immediately south of the channel mouth was the best option due to the need for material and the closeness of the site. The design includes two placement sites separated by an existing headland breakwater system (Figure 13).

To actively mitigate shoreline erosion, approximately 22,700 cubic yards of clean, sandy dredged material will be beneficially placed to nourish the southern shoreline. This strategic placement is expected to expand the shoreline footprint by approximately 90,400 ft^2 (2.1 acres). Placement Area 1, located north of the breakwater system, encompasses approximately 58,000 ft^2 and extends about 485 ft in length and up to 230 ft in width, tapering into the breakwaters. Placement Area 2, located south of the breakwaters, covers approximately 32,400 ft^2, extending about 420 ft in length and up to 120 ft in width. The objective of this nourishment is to protect the eroding uplands and restore the shoreline to its approximate 1994 morphology.

The dredged material will be transported hydraulically via pipeline directly from the river to the shoreline. Hydraulic transport is highly efficient because the water acts as a slurry

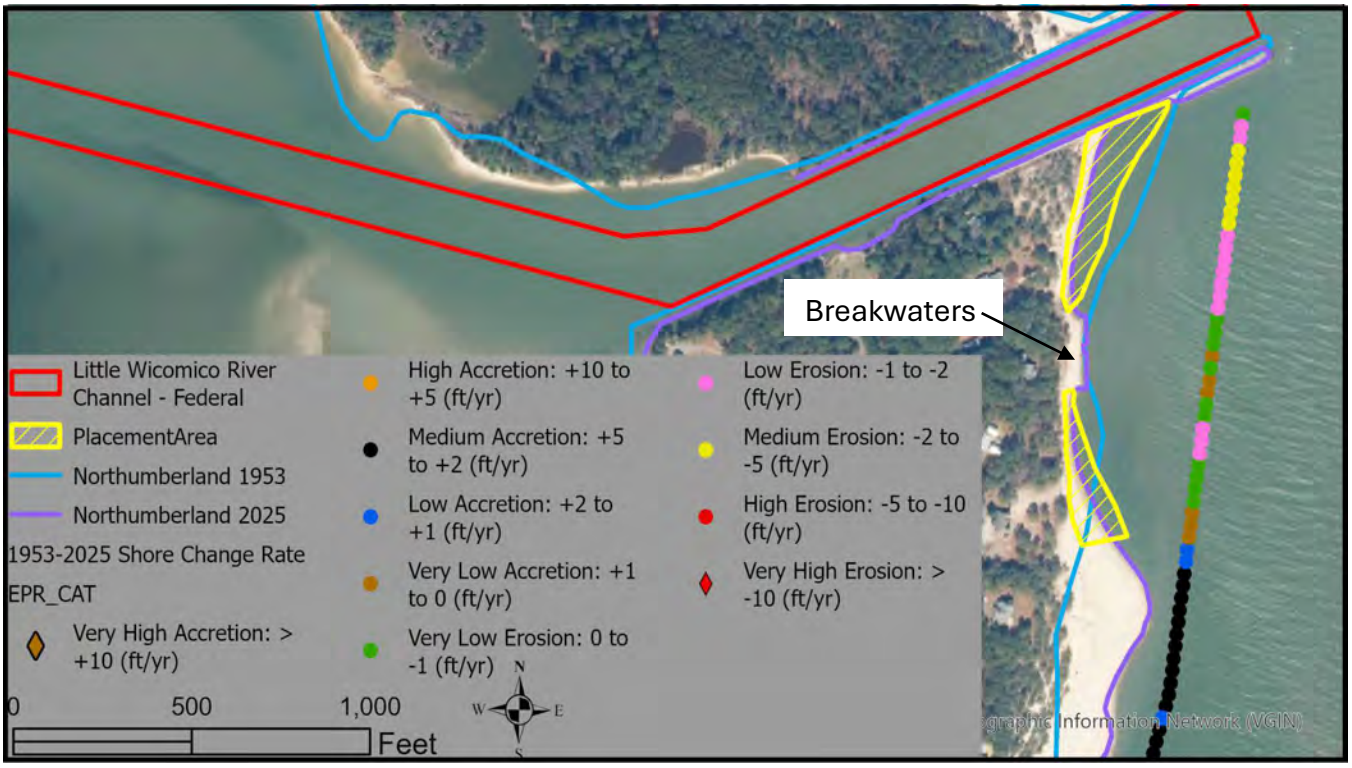

Figure 12. A 2025 photo showing the 1953 and 2025 digitized shorelines, the 1953-2025 endpoint rate of change, and the proposed beneficial use placement area for the sandy material from the Little Wicomico River channel.

medium, allowing continuous transport. Once discharged onto the beach, the slurry will naturally dewater, and heavy construction equipment will mechanically shift the dry sand to match the final engineered design templates.

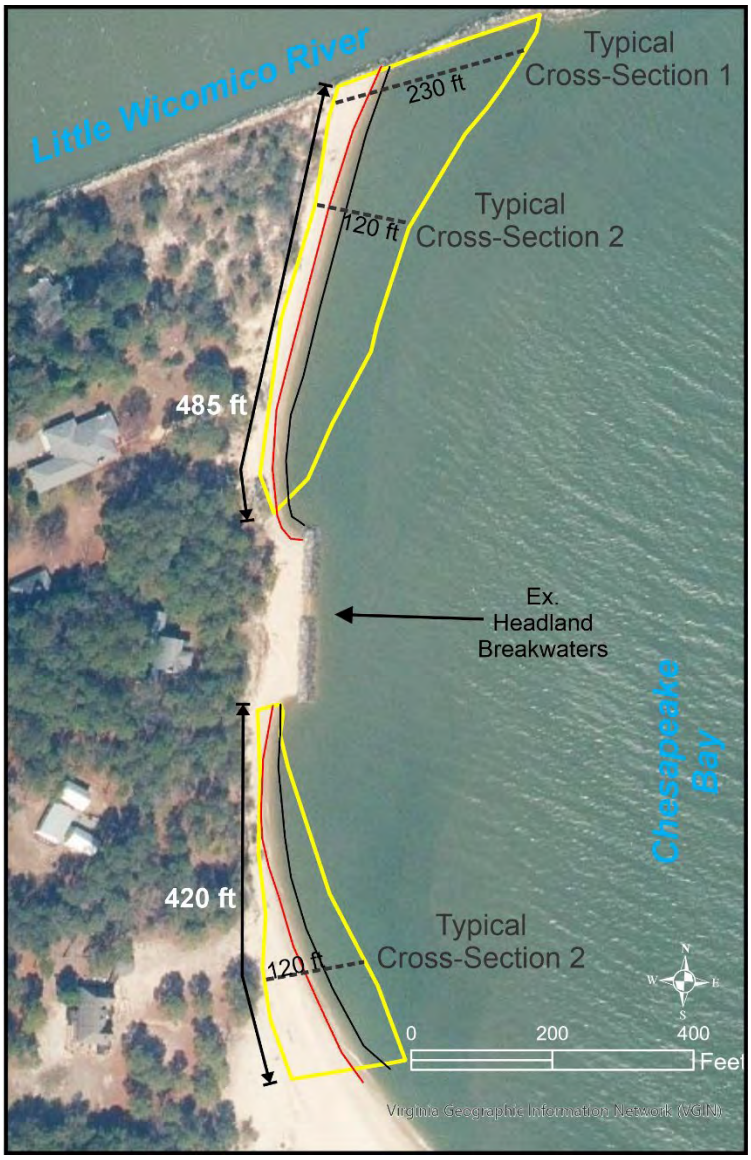

Figure 13. Proposed beneficial use placement area for sandy material from the Little Wicomico River. The material will be placed in front of the existing vegetation.

The placement template utilizes a multi-tiered berm configuration to dissipate wave energy. Two representative cross-shore profiles have been developed for the placement areas. In Profile 1, sand will be placed at an elevation of +7 ft MLW adjacent to the existing eroding bank (Figure 14). A 40 ft wide berm will be created and planted with high marsh grasses, and the material will then extend to the existing bottom elevation at -3 ft MLW. In Profile 2, sand placement also begins at +7 ft MLW with a 40 ft wide berm, but the profile slopes more gradually to a lower elevation of -4 ft MLW. The material will be dewatered along the shoreline and then moved to the final template with construction equipment. The proposed activities are designed to maintain navigational safety while beneficially reusing dredged material to enhance shoreline stability and reduce erosion along the southern shoreline of the Little Wicomico River entrance.

To ensure the stabilization of this placed material, vegetation will be planted. Without vegetation, the 22,700 cubic yards of newly placed sand would be highly susceptible to rapid wind and water erosion. Therefore, along the 40-foot wide upper berm at the +7 ft MLW elevation, sand fencing will be installed and high marsh grasses planted, specifically Spartina

patens (Saltmeadow cordgrass). The vegetation will be installed uniformly on a 2-foot by 2-foot grid pattern across the upper berm.

The above-ground biomass of Spartina patens acts as a frictional baffle. During extreme high-tide events, this biomass slows the velocity of overwash waters, reducing their erosive energy. Additionally, the grass captures wind-blown sand, which naturally builds the backshore's height and volume over time, creating a self-sustaining system. Second, the extensive rhizome root networks of the grass bind the underlying sand. This decreases the loss of berm material, preventing the sand from washing back into the newly dredged navigation channel.

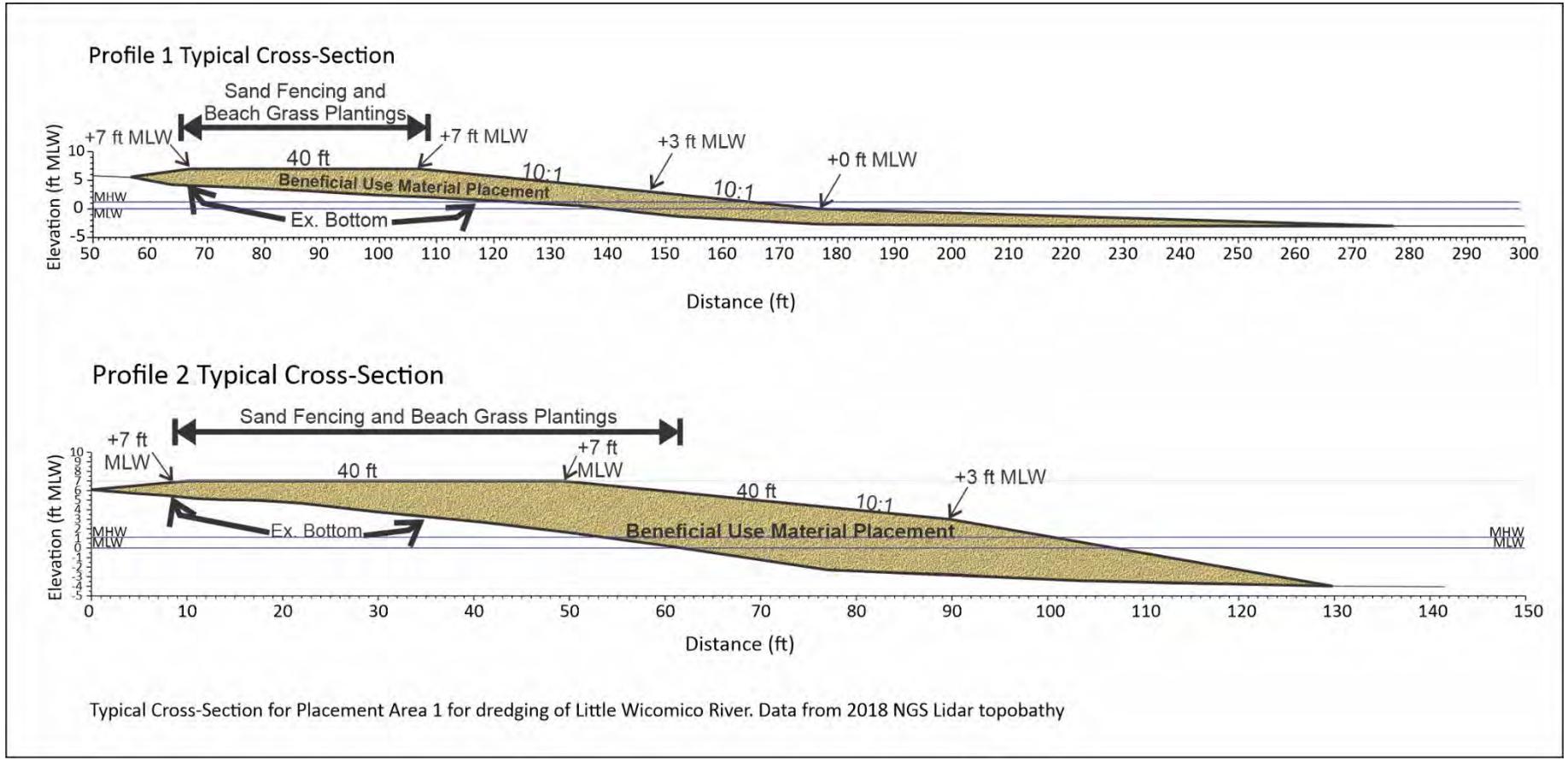

Figure 14. Proposed typical cross-sections for the beneficial use placement of sandy material from the Little Wicomico River federal channel dredging.

7.3 Costs

Estimated costs were provided by Waterway Surveys & Engineering. The cost shown in Table 5 includes pumping a total of 22,700 cy of material from the channel and placing it along the shoreline northeast of the channel. The use of vegetation and sand fencing on the landward portions of beach nourishment projects can reinforce the stability of the material placed at the site.

Dredging Mobilization includes all costs for operations accomplished before commencement of actual dredging operations. This includes, as a minimum, the following:

- Transfer of dredge and attendant plant, booster pumps, bulldozers, and other like equipment and machinery for site work.
- All initial installation of pipe, if required.
- All costs for any other associated work that is necessary in advance of the actual dredging operations.

Dredging Demobilization includes general preparation for the transfer of the plant to its home base, removal of pipelines, cleanup of the site of work areas, and transfer of plants to their home base.

Table 5. Estimated cost for dredging of the Little Wicomico channel and placement on the adjacent shoreline.

Item	Cost per unit	Total
Engineering design, construction management, permitting	Lump sum price	$75,000
Mobilization and demobilization	Lump sum price	$925,000
Dredging	–8 ft MLW with 2 ft of allowable overdepth with placement on nearby beach: Estimated quantity of 22,700 C.Y. @ $ 24.00 per C.Y.	$432,000
	Total Estimated Cost	**$1,432,000**

7.4 Useful Life Estimates

The Little Wicomico River has not been dredged since 2014, but was surveyed by the USACE in 2016, 2017, 2022, and 2023. This data can be used to guide the predicted useful life of the proposed project. The rate of infill referenced to -9 ft MLW from 2016 (4,400 cy) to 2025

(17,500 cy) over 11 years is about 1,190 cy/yr. The inner portion of the channel has generally maintained its authorized depth over time; however, the channel mouth continues to shoal and is expected to require periodic maintenance dredging. While the interior channel is relatively deep (–9 ft MLW), sediment from eroding shorelines and inlet bars is being deposited along its edges, creating shallow shoals immediately outside the dredged footprint. Shoaling within the channel is not linear; it starts quickly after dredging but slows over time as the channel reaches equilibrium.

Overall, a rough estimate of the useful life of this project is 5-8 years. Most of the channel should remain navigable during that period and possibly even longer. However, the mouth of the channel will continue to be the first to begin filling again and will need to be maintained.

Much of the channel shoaling results from sediment overtopping the jetties and accumulating at the river entrance. During high-energy storms, sediment enters the channel from the north and/or the south, depending on the main direction of wave approach. The southern jetty has deteriorated and no longer provides adequate protection from sediment transported from the south (Figure 15). The inner portion of the channel is lower in elevation than the outer portion of the jetty. Raising the jetty would assist in maintaining the channel by reducing the amount of sediment transported over the structure and into the channel. Future evaluation of jetty rehabilitation, increased crest elevations, or sediment bypassing strategies may help reduce sediment influx, mitigate shoaling, and extend maintenance dredging intervals.

Figure 15. Reported conditions of the southern jetty after a storm. Photo taken Nov 5th, 2025.

8 Regulatory Framework, Permitting, and Stakeholder Coordination

Significant coordination is needed for permitting the combined dredging and shoreline restoration project. The permitting process is governed by the U.S. Army Corps of Engineers Regulatory Request System (RRS). This new process, which started in the fall of 2025, requires applicants to submit data to an online portal for processing. The goal of this new system is to enhance transparency and improve public engagement with the USACE Regulatory Program. This new module allows the applicant to answer a series of questions about their proposed activity to determine if authorization from USACE is required. Questions are provided in stepwise sequential order, and if the information provided through the RRS results in a response that no permit is required for the proposed activity, users will immediately be provided with correspondence. If the information provided results in a response that a permit is required, the user is provided the option to apply for a permit or preapplication meeting through the appropriate RRS application module.

In the past, the Joint Permit Application (JPA) was used to apply for both local, state, and federal permits. Though the RRS system asks for similar information, the JPA is still a regulatory mechanism that simultaneously satisfies the permitting requirements of the Virginia Marine Resources Commission (VMRC), the Virginia Department of Environmental Quality (DEQ), the U.S. Army Corps of Engineers (USACE), and the local Northumberland County Wetlands Board. Because the Maryland/Virginia boundary is at MLW, a small section of the dredge project occurs in Maryland waters. The Maryland Department of the Environment (MDE) may need to comment on the project. Because the project occurs within a federally authorized navigation channel, coordination under Section 408 of the Rivers and Harbors Act may be required. Section 408 review evaluates whether proposed alterations are compatible with the authorized federal project and do not impair its usefulness.

A critical component of the JPA process is the notification and coordination with adjacent property owners and oyster lease holders. The permit application requires the identification and notification of all parties immediately adjacent to or impacted by the project. Adjacent property owners were required to sign an acknowledgement form distributed by the county. This form confirmed their approval of the proposed project and subsequent construction on or around their property.

9 Summary

The Little Wicomico River is a tidal river that empties into the Potomac on the northwestern shore of Chesapeake Bay, at the Maryland-Virginia boundary. It is an important gateway for residents and the local maritime economy, providing access to an active working waterfront that supports residential, recreational, and commercial maritime activities. Many of the river's navigational challenges stem from disruptions to natural sediment transport processes at the river mouth. Sediment that bypasses and overtops the existing jetties accumulates within the entrance channel, resulting in chronic shoaling, reduced navigable depths, and impaired access for recreational and commercial vessels. The report notes that the mouth has become severely shoaled, restricting vessel access and undermining safe navigation. This is part of a broader regional challenge, as many Northern Neck channels are restricted or shoaled, which can affect boating safety, commercial access, and the broader coastal economy.

The project goal was to design a dredging project. This effort is a conceptual design to assist with permitting. It is a planning and design effort intended to prepare for future dredging by measuring current river conditions, determining how much material would need to be removed to restore the authorized channel, confirming whether dredged material is clean and suitable for reuse, reviewing environmental considerations, and providing cost and maintenance planning information.

The Little Wicomico River federal navigation channel was authorized in 1935 with dimensions of 150 ft wide by -8 ft MLW. Since its authorization, the channel has been dredged on at least three occasions: 1984, 2003, and 2014. Bathymetric surveys conducted in late 2024 were used to develop a detailed DEM of the channel bottom. Although the channel is authorized to -8 ft MLW, the proposed project asks for up to 2 ft of overdepth dredging, resulting in a maximum dredge depth of -10 ft MLW. Shoaling is most severe near the river mouth, where sediment accumulation has significantly reduced navigable depths and nearly blocked access through the entrance channel.

Sediment cores from the outer portion of the federal channel indicate the dredge material is mostly sand (about 94%), with grain sizes consistent with typical beach nourishment needs. The inner portion of the channel contains more silt and clay, and remains deep enough (-9 ft MLW) to not dredge this area for the current dredge cycle. This matters because sand-rich material is stable and useful for shoreline projects, while very fine muddy

material is not suitable for beaches. Because placing dredged material on a shoreline requires careful review, the project evaluated environmental risk using widely accepted federal guidance. Based on the river setting and sediment type, initial screening indicated low contamination risk, but additional laboratory testing was performed to confirm. The chemical testing results reported that a broad range of potential contaminants were not detected above laboratory reporting limits, supporting the conclusion that the sediment is suitable for beneficial shoreline placement.

The report reviews benthic habitat, fisheries, and sensitive resources. In general, dredging temporarily disturbs bottom habitat in the dredge footprint, but estuarine systems often recover relatively quickly as organisms recolonize. Regulators may require seasonal timing restrictions to protect migrating fish or other sensitive periods, but the project area does not overlap mapped SAV beds. The area being dredged crosses 2 private oyster leases. Federally protected species may occur in the broader region (notably Atlantic sturgeon and, less commonly, manatees), so future implementation would incorporate best practices and regulatory coordination.

For the proposed project, approximately 22,700 cubic yards of sediment have accumulated within the federal channel and require removal. A major feature of the concept design is to reuse the dredged sand to help address erosion on the shoreline south of the river mouth. This approach turns a maintenance need into a resilience benefit by restoring safe boating access to the public landing and working waterfront, and creating a wider, more stable shoreline feature designed to reduce wave impacts and slow erosion. The plan would place sand along a combined 900 ft of shoreline, split between an existing breakwater system. The sand will build a shaped berm system and plant vegetation (such as saltmeadow cordgrass) to help keep the material in place and reduce the chance of the sediment returning to the channel.

A planning-level estimate for dredging and beneficial placement is about $1.43 million. Based on historic dredging intervals and survey trends, the project could provide about 5-8 years of improved navigation overall, though the river mouth is expected to refill first and may require maintenance sooner.

To move from design to construction, the sponsor would pursue federal, state, and local permits, including property owner coordination and stakeholder notifications. The report notes newer federal processes intended to improve transparency and efficiency for permit

applications. The project also benefits from existing policy pathways for certain maintenance work in authorized federal channels.

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Appendix A

Core Photos

Little Wicomico River Core 1 Section A 0 ft – 1.21 ft

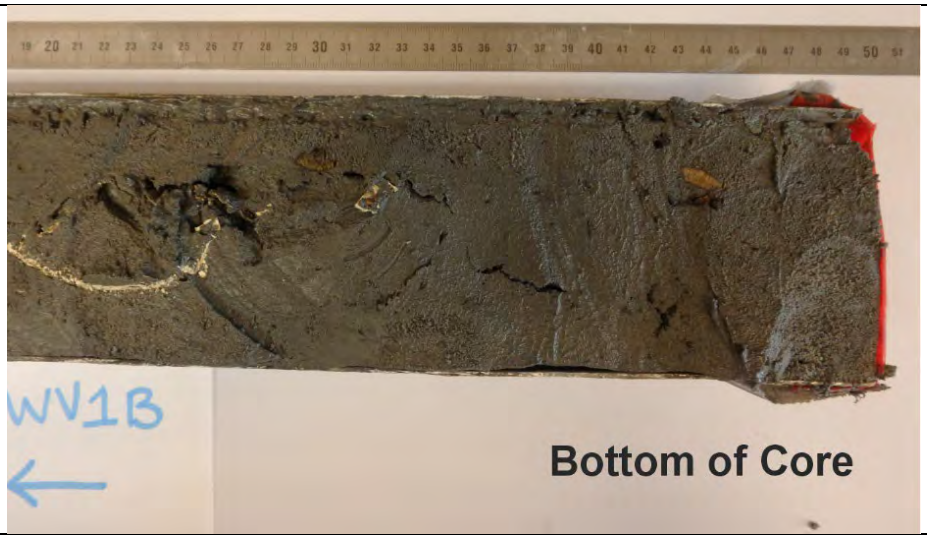
Little Wicomico River Core 1 Section A 1.08 ft – 2.20 ft

Little Wicomico River Core 1 Section A 2.10 ft – 3.35 ft

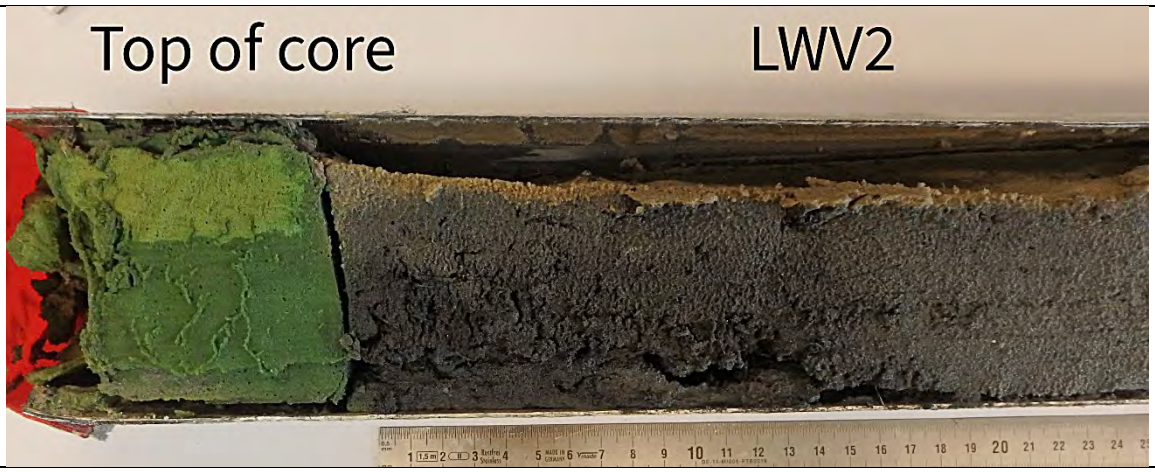
Little Wicomico River Core 1 Section A 3.18 ft – 4.53 ft

Little Wicomico River Core 1 Section B 0 ft – 0.92 ft

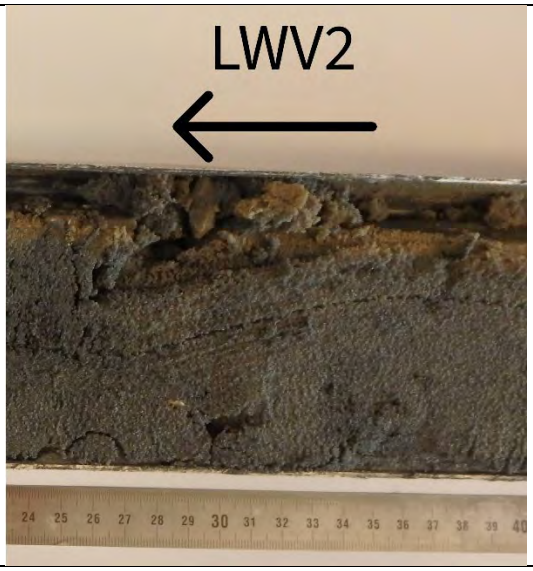
Little Wicomico River Core 1 Section B 0.26 ft – 1.31 ft



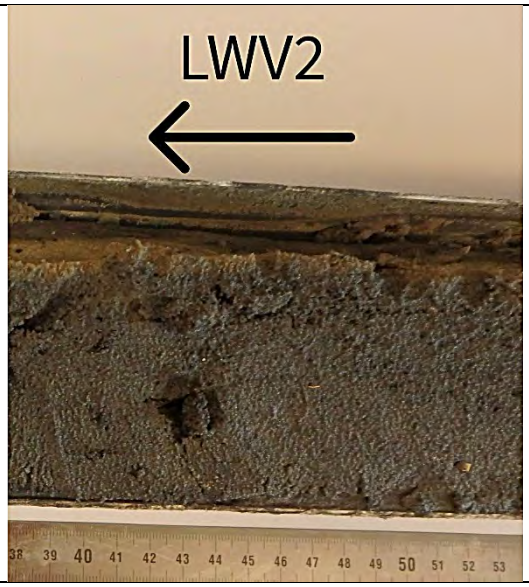
Little Wicomico River Core 1 Section B 0.62 ft – 1.64 ft



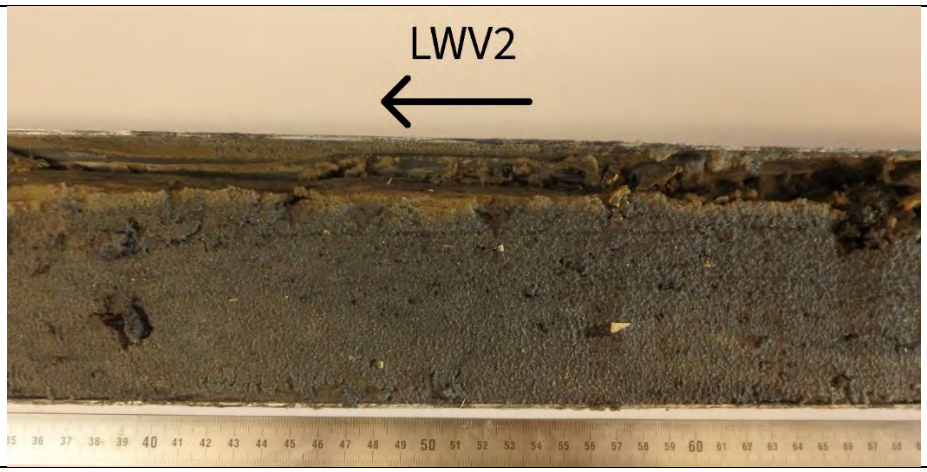
Little Wicomico River Core 2 0 ft – 0.82 ft



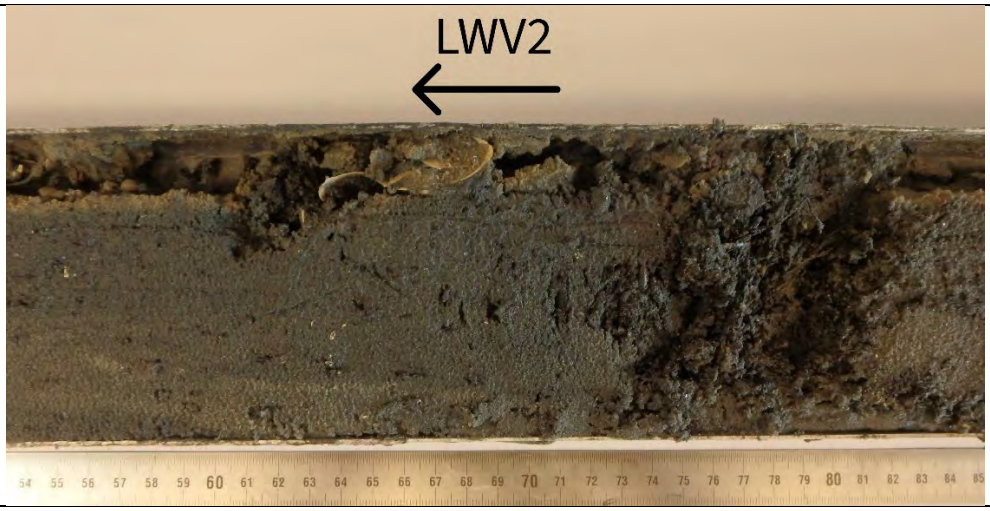
Little Wicomico River Core 2 0.77 ft – 1.31 ft



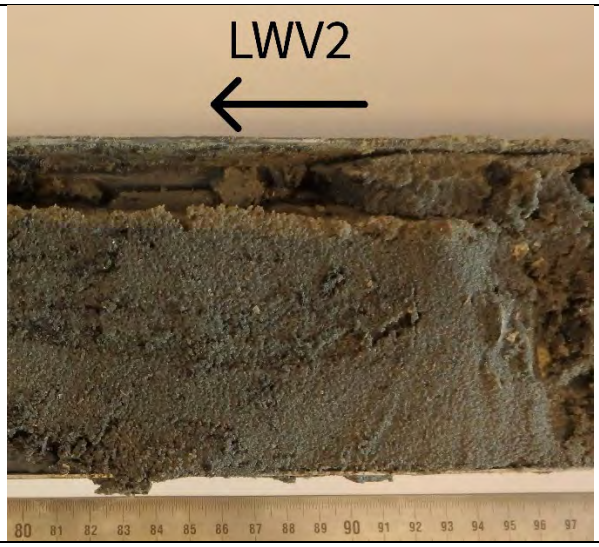
Little Wicomico River Core 2 1.25 ft – 1.77 ft



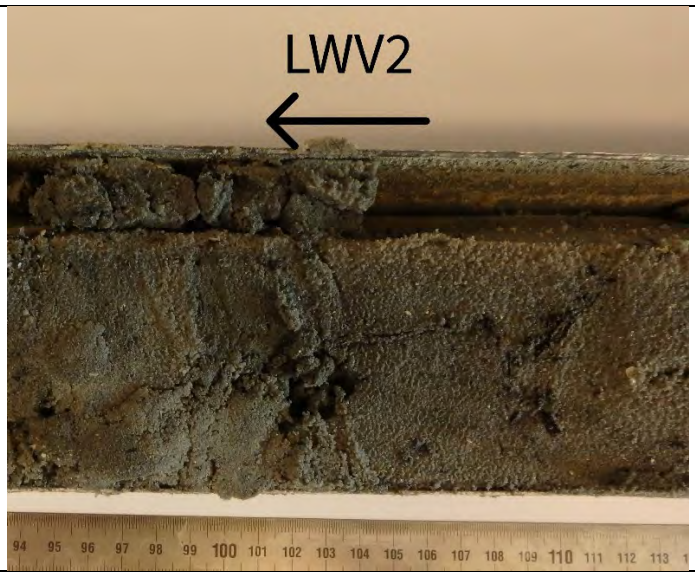
Little Wicomico River Core 2 1.15 ft – 2.25 ft



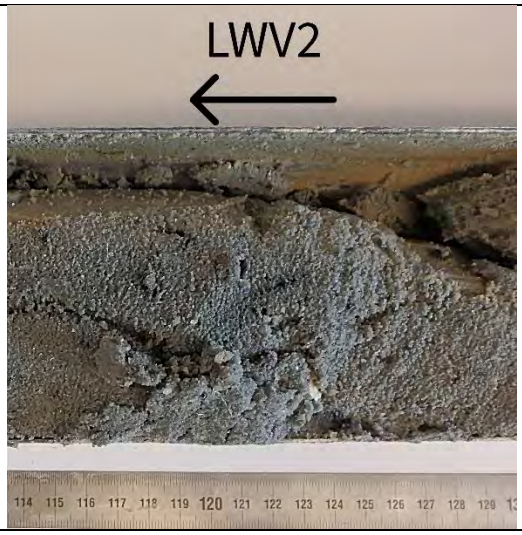
Little Wicomico River Core 2 1.76 ft – 2.79 ft



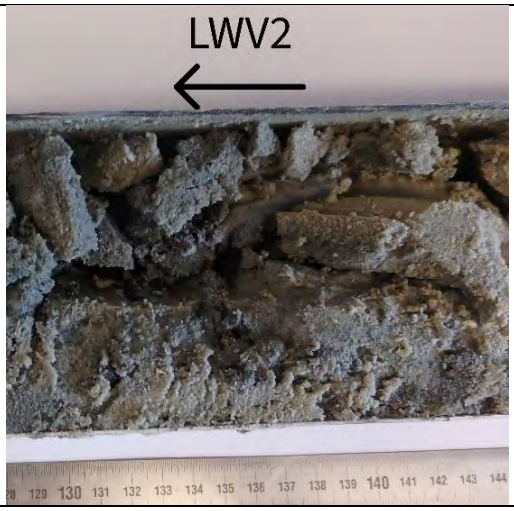
Little Wicomico River Core 2 2.59 ft – 3.20 ft



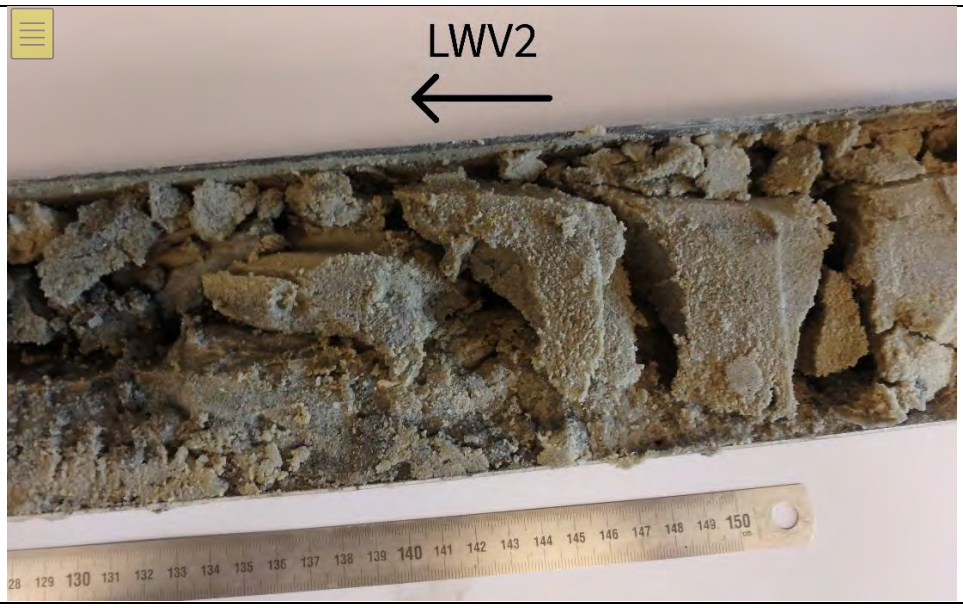
Little Wicomico River Core 2 3.07 ft – 3.74 ft



Little Wicomico River Core B 3.72 ft – 4.27 ft

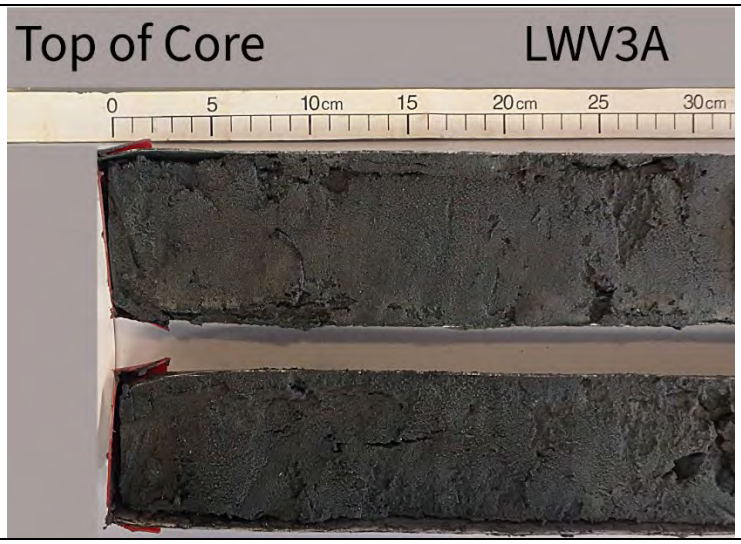


Little Wicomico River Core B 4.20 ft – 4.74 ft

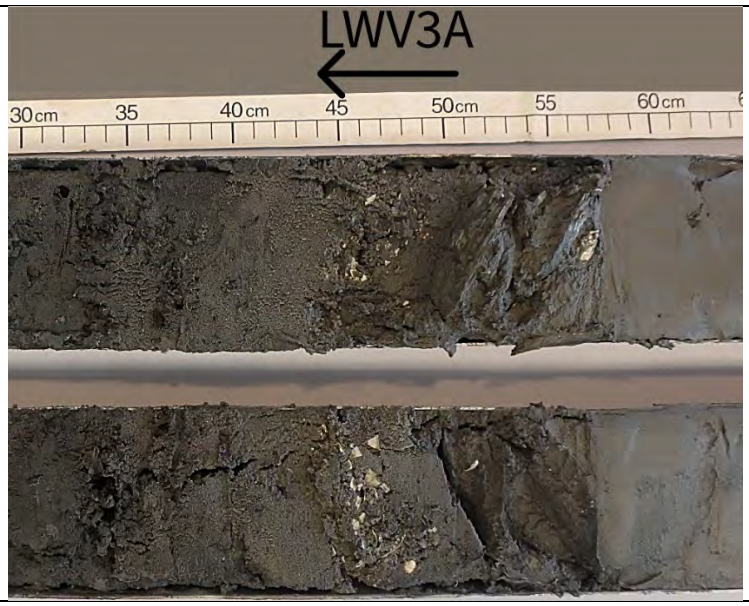


Little Wicomico River Core B 4.20 ft – 4.92 ft

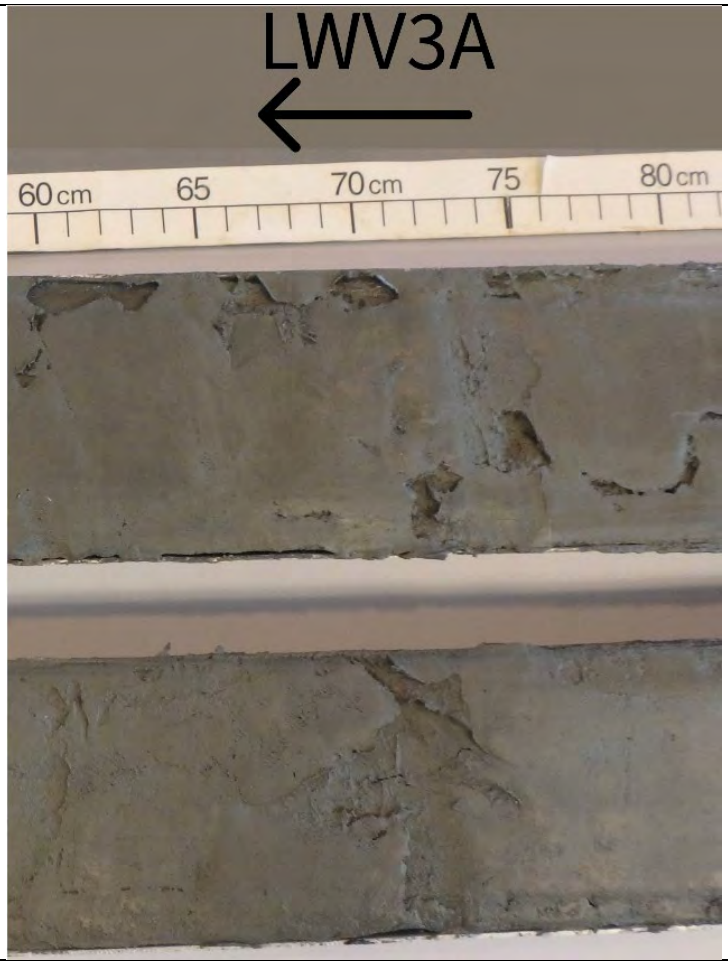
Little Wicomico River Core 2 4.46 ft – 4.92 ft



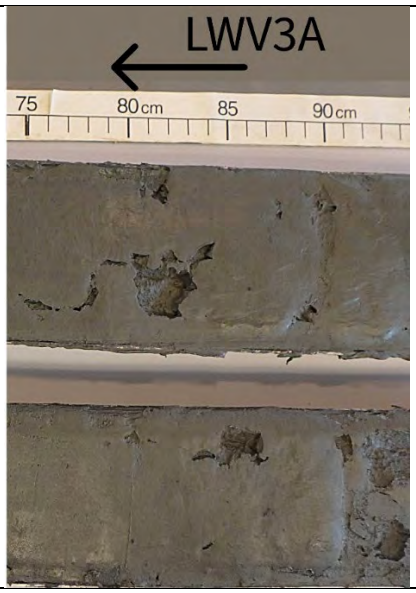
Little Wicomico River Core 3 Section A 0 ft – 1.05 ft



Little Wicomico River Core 3 Section A 1 ft – 2.13 ft

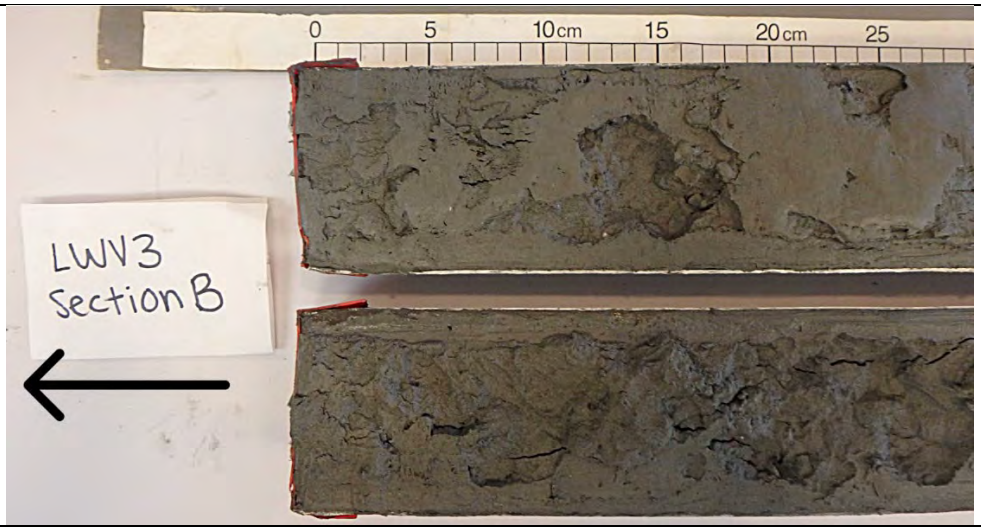


Little Wicomico River Core 3 Section A 1.94 ft – 2.69 ft

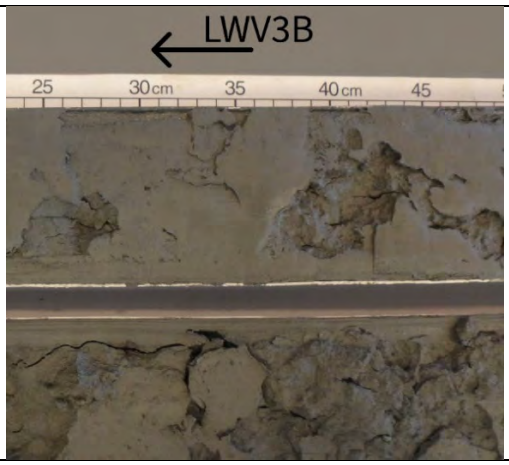


Little Wicomico River Core 3 Section A 2.43 ft – 3.12 ft

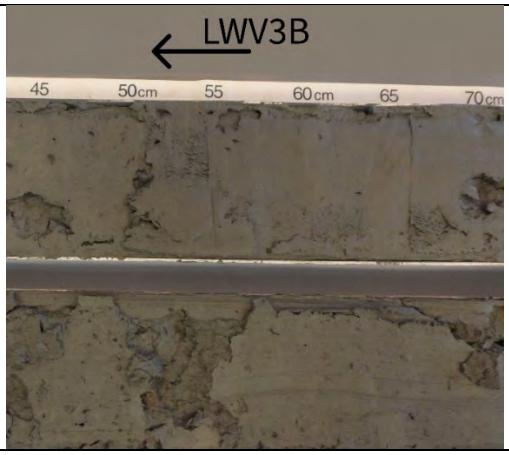
Little Wicomico River Core 3 Section A 2.92 ft – 3.38 ft



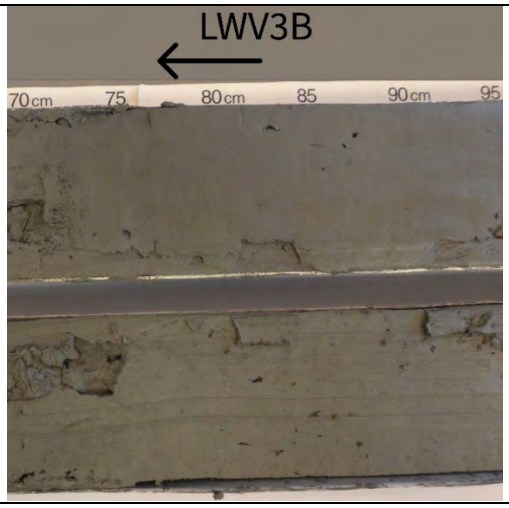
Little Wicomico River Core 3 Section B 0 ft – 1 ft



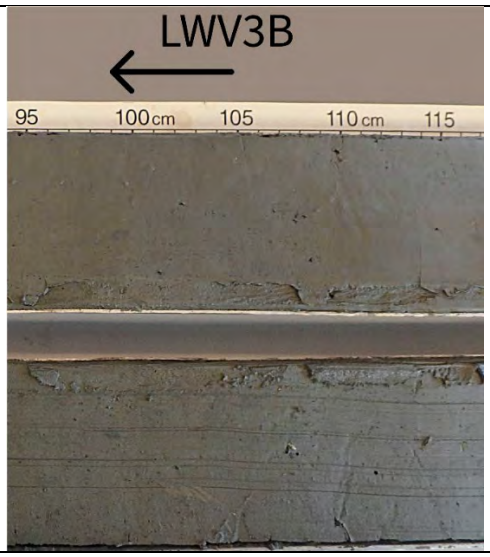
Little Wicomico River Core 3 Section B 0.75 ft – 1.64 ft



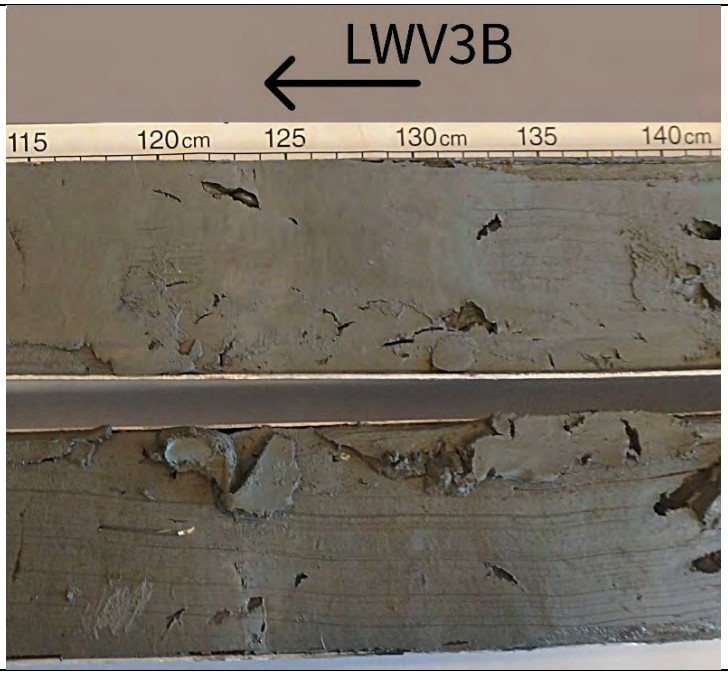
Little Wicomico River Core 3 Section B 1.41 ft – 2.30 ft



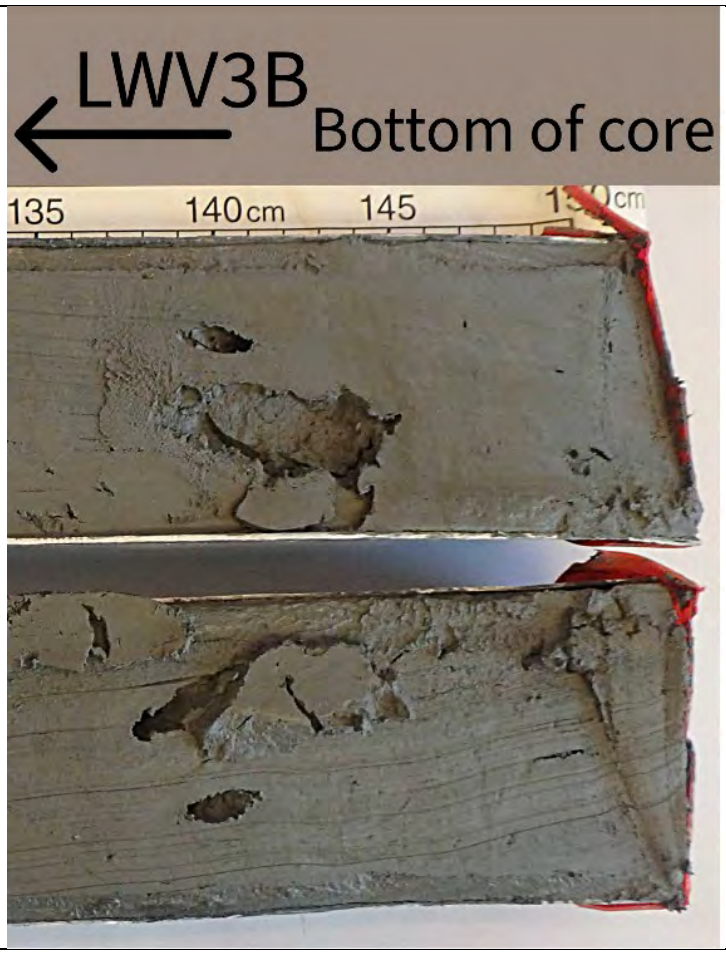
Little Wicomico River Core 3 Section B 2.30 ft – 3.12 ft



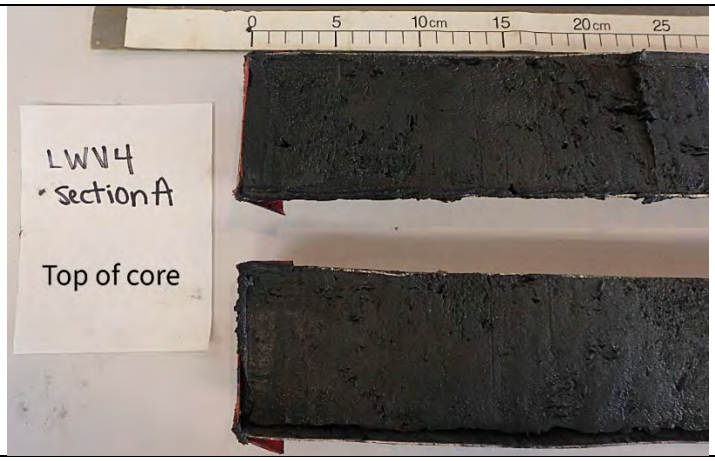
Little Wicomico River Core 3 Section B 3.12 ft – 3.84 ft



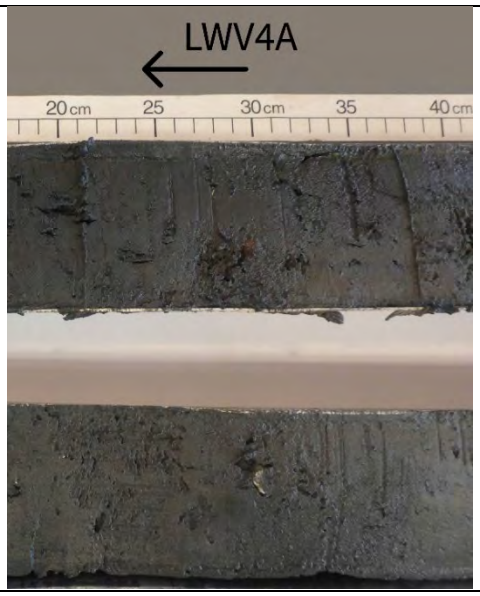
Little Wicomico River Core 3 Section B 3.77 ft – 4.66 ft



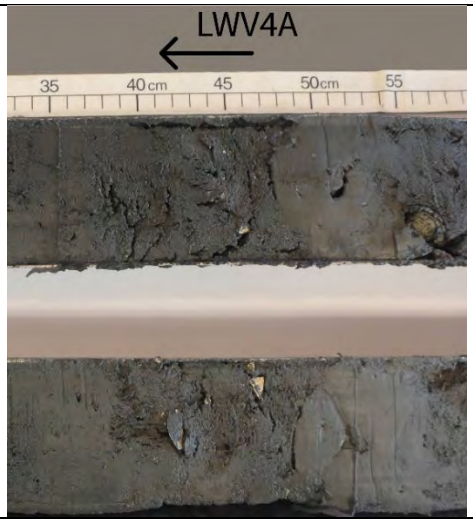
Little Wicomico River Core 3 Section B 4.40 ft – 4.92 ft



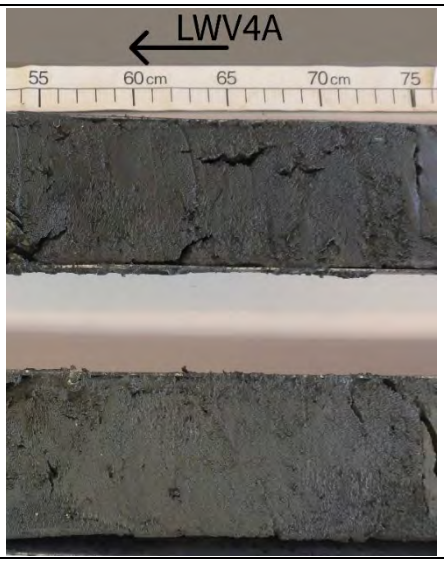
Little Wicomico River Core 4 Section A 0 ft – 0.92 ft



Little Wicomico River Core 4 Section A 0.57 ft – 1.35 ft

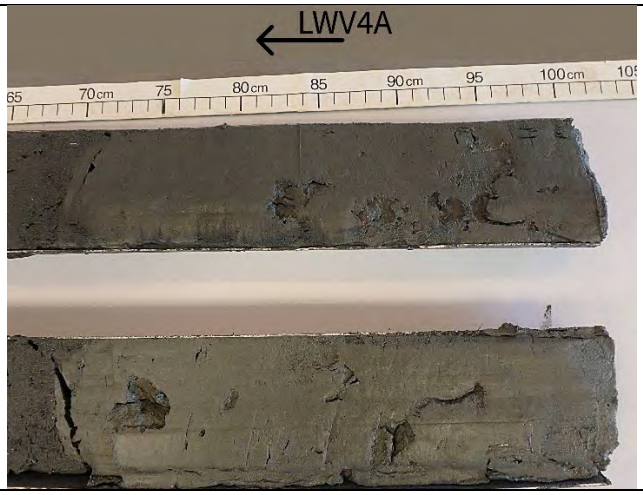


Little Wicomico River Core 4 Section A 1.08 ft – 1.94 ft



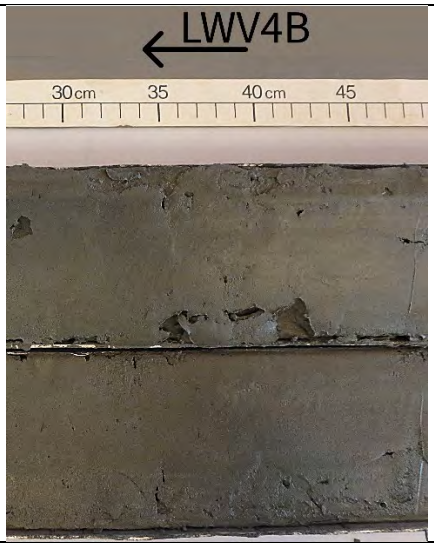
Little Wicomico River Core 4 Section A 1.77 ft – 2.49 ft

Little Wicomico River Core 4 Section A 2.40 ft – 3.28 ft

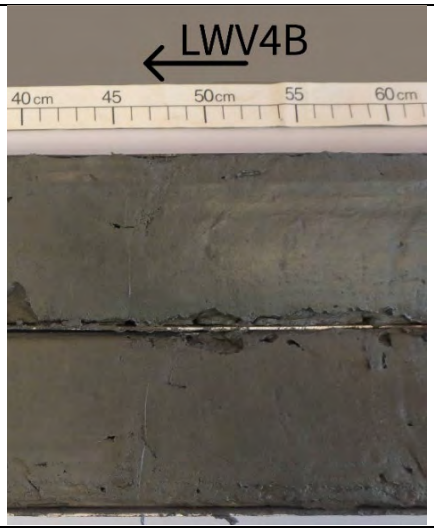


Little Wicomico River Core 4 Section A 2.13 ft – 3.44 ft

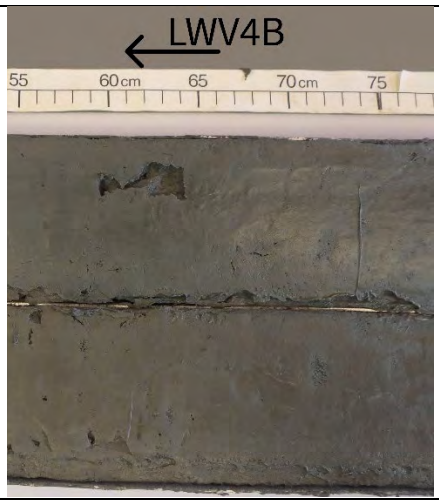
Little Wicomico River Core 4 Section B 0 ft – 1 ft



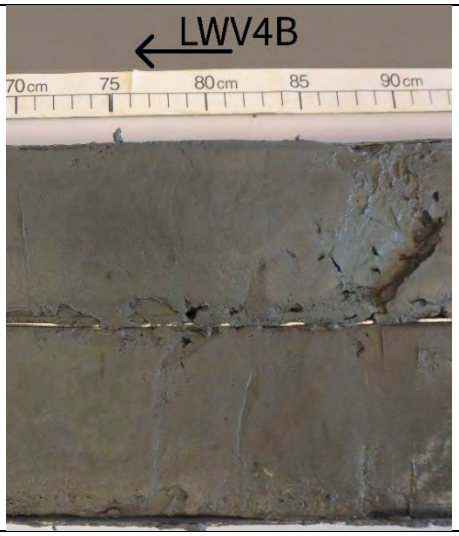
Little Wicomico River Core 4 Section B 0.89 ft – 1.61 ft



Little Wicomico River Core 4 Section B 1.31 ft – 2.03 ft

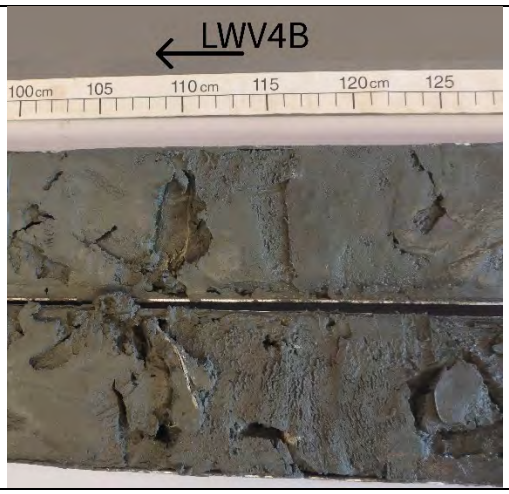


Little Wicomico River Core 4 Section B 1.80 ft – 2.56 ft

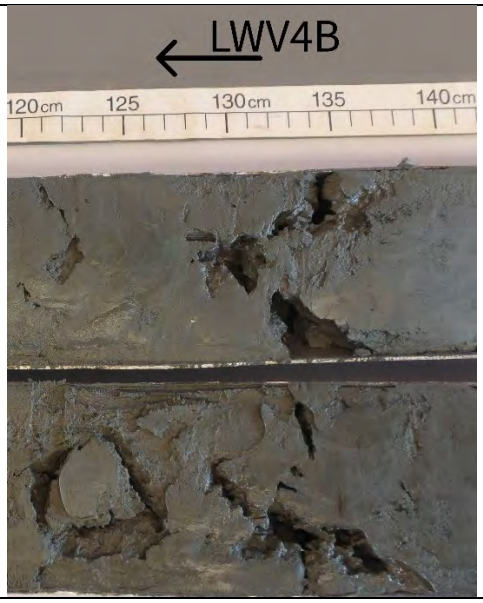


Little Wicomico River Core 4 Section B 2.30 ft – 3.05 ft

Little Wicomico River Core 4 Section B 2.17 ft – 3.54 ft

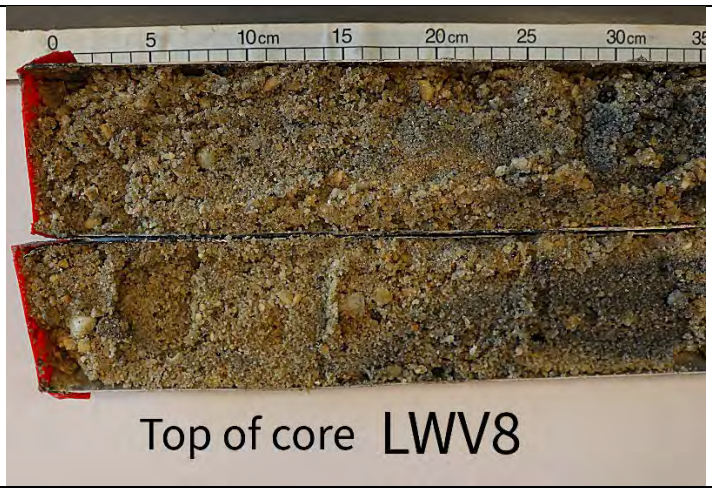


Little Wicomico River Core 4 Section B 3.28 ft – 4.20 ft

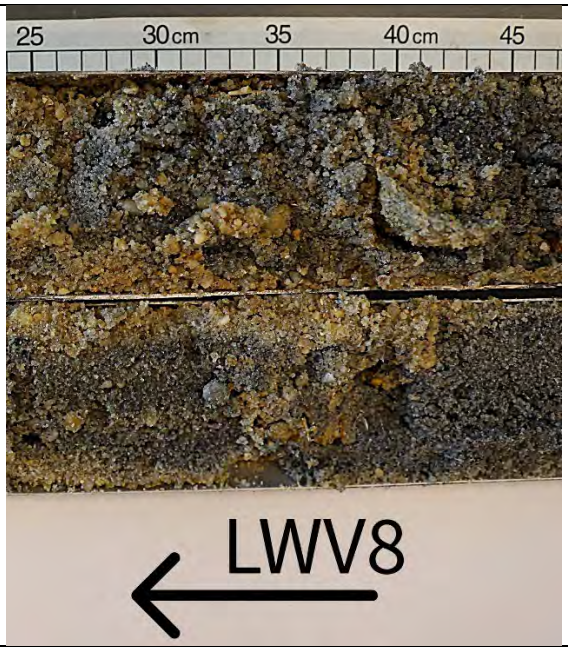


Little Wicomico River Core 4 Section B 3.94 ft – 4.66 ft

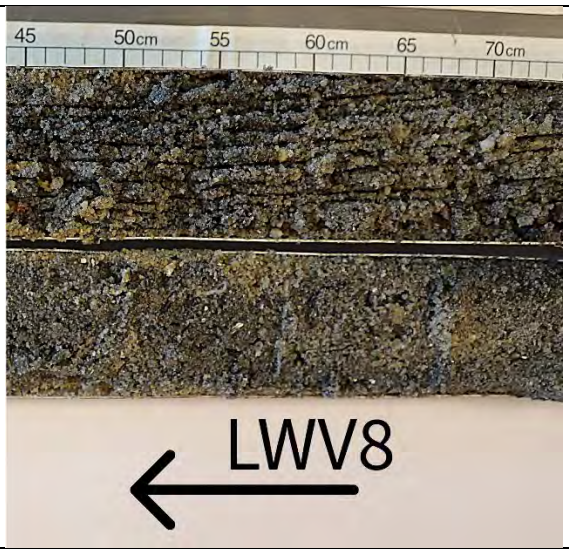
Little Wicomico River Core 4 Section B 4.07 ft – 4.92 ft



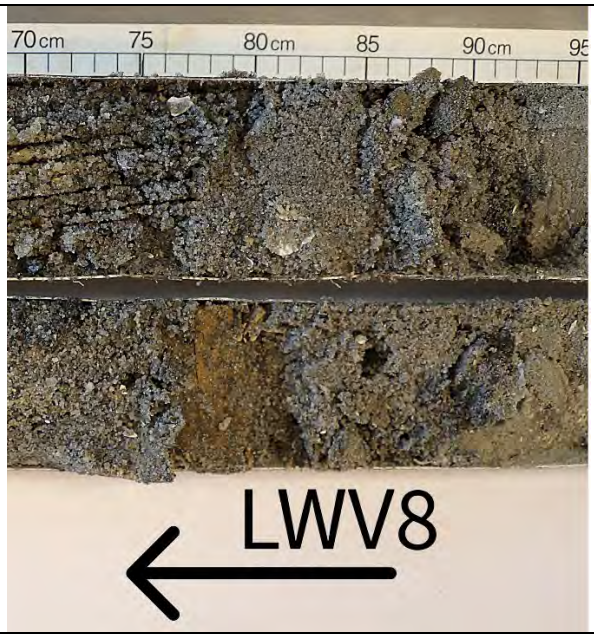
Little Wicomico River Core 8 Section A 0 ft – 1.15 ft



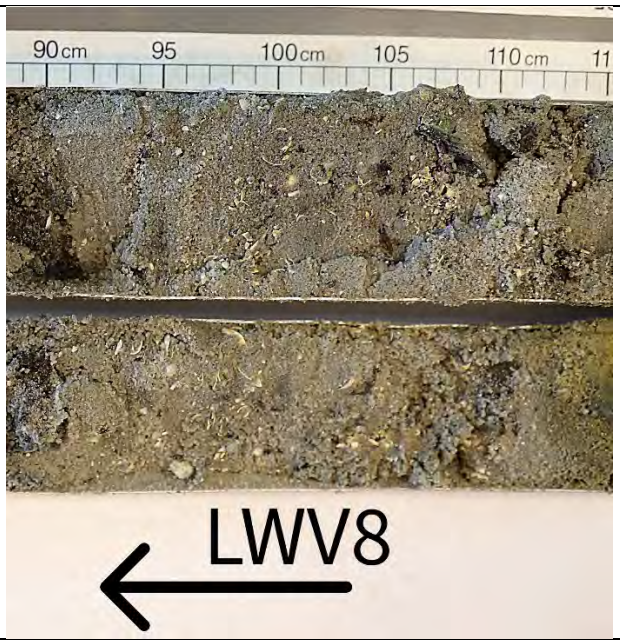
Little Wicomico River Core 8 Section A 0.82 ft – 1.54 ft



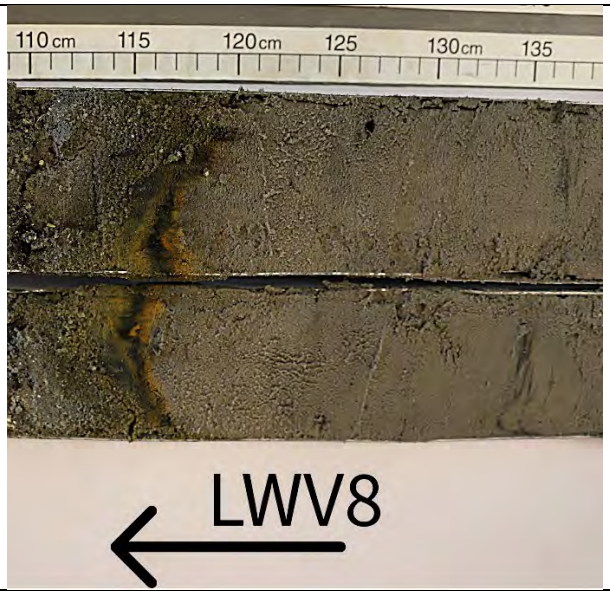
Little Wicomico River Core 8 Section A 1.50 ft – 2.40 ft



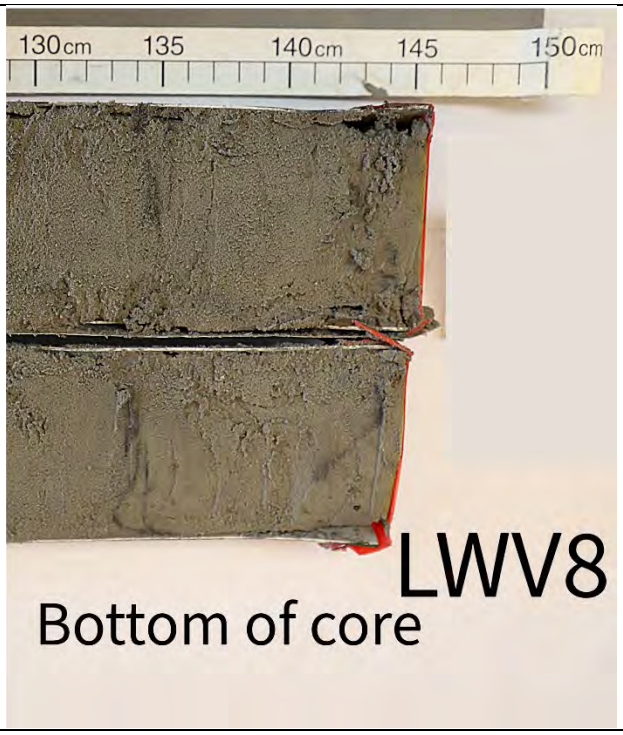
Little Wicomico River Core 8 Section A 2.30 ft – 3.11 ft



Little Wicomico River Core 8 Section A 2.91ft – 3.74ft



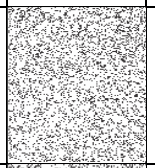
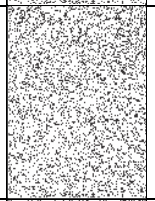
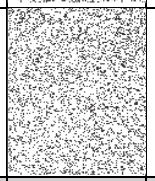
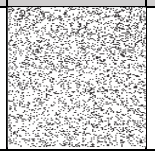
Little Wicomico River Core 8 Section A 3.61 ft – 4.53ft



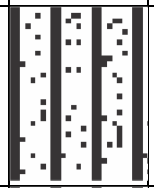
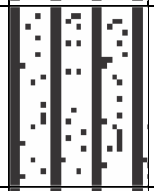
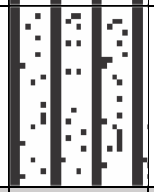
Little Wicomico River Core 8 Section A 4.23 ft – 4.79ft

Appendix B
Core Logs

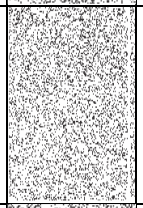
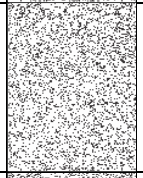
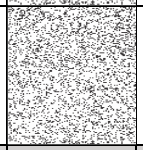
Little Wicomico Core 1 Latitude: 37.8882 Longitude: -76.2414 Date: 3/9/2025

Section	Depth (ft)	Depth Below Sediment Surface MLLW (ft)	Graphic	USCS Soil Type	Description	Color	Grain Size (mm) %G/SD/S/C %Fines %Moisture	Comments
LWR1A	0-1.08	-7.6		**SP**	Fine-sorted, coarse sand with no visible structures and small (>0.2cm) broken shells. Oxidation pockets present 0-0.09ft	Light gray-brown	0.46 0/99/1/0 1 10.7	
LWR1A	1.08-1.87	-7.6 to -8.2		**SP**	Fine-sorted, coarse sand with small broken shells (>0.2cm), woody fragments (>1cm) from 1.1-1.4ft, large wood layer from 1.3-1.5ft	Light gray-brown	0.45 0/99/1/0 1 12.5	
LWR1A	57-80cm	-8.6		**SP**	Fine-sorted, coarse sand with small broken shells (>0.2cm) and abundant wood fragments (>1cm)	Light gray-brown	0.39 0/99/1/0 2 20.2	
LWR1A	80-135cm	-9.1 to -10.6		**SP**	Fine-sorted, coarse sand with small broken shells (>0.2cm) and abundant wood fragments (>1cm). Large collection of wood fragments at 3.31ft	Light gray-brown	0.38 0/98.25/1.25/0.75 1.75 16.37	
LWR1A					End of Section A (Core 1)			
LWR1B	135-146cm	-10.6		**SP**	Fine-sorted, coarse sand with no visible structures. Small shells (>0.1cm) are present.	Gray	0.34 0/98/1/1 2 17.9	

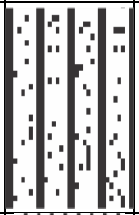
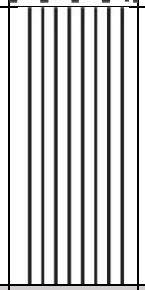
Little Wicomico Core 1 Latitude: 37.8882 Longitude: -76.2414 Date: 3/9/2025

Section	Depth (ft)	Depth Below Sediment Surface MLLW (ft)	Graphic	USCS Soil Type	Description	Color	Grain Size (mm) %G/SD/S/C %Fines %Moisture	Comments
LWR1B	148-152cm	-11.5		**SM**	Coarse sand mixed with very fine silt. High abundance of shells (>0.2cm) and large white pebbles (0.2-0.6cm)	Dark Gray	0.25 0/88/10/2 12 17.7	
LWR1B	152-175cm	-12.1		**SM**	Sticky silt with pockets of very fine sand. Large shell present from 5.12-5.4ft and a large wood chunk present at 5.45ft	Dark grey brown	0.10 0/70/26/3 30 36.4	
LWR1B	175-182cm	-12.5		**SM**	Fine-sorted, sand with some silt. Large wood chunk present at 5.64ft	Dark grey brown	0.28 0/82/16/1 18 20.8	
LWR1B	**Core**				**End of Core 1 (A&B)**			

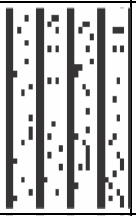
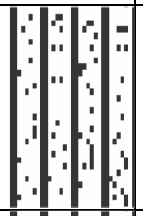
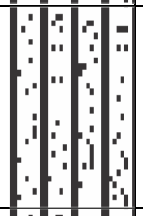
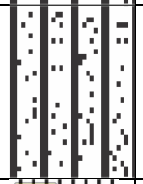
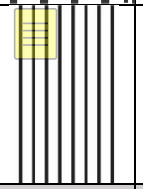
Little Wicomico Core 2 Latitude: 37.8892 Longitude: -76.2429 Date: 3/9/2025

Section	Depth (ft)	Depth Below Sediment Surface MLLW (ft)	Graphic	USCS Soil Type	Description	Color	Grain Size %G/SD/S/C %Fines %Moisture	Comments
LWR2	0-31cm	-6.9		**SP**	Well-sorted fine sand with some wood and rock fragments. Decayed organic material present with a few shells (<0.1cm)	Reddish-brown	0.27 32/67/2/0 2 19.7	
LWR2	31-89cm	-7.4 to -9.1		**SP**	Well-sorted fine dark gray brown sand with pockets of reddish brown sand. Abundant shells present (<0.4cm)	Grayish-brown	0.28 30.5/67.5/2/0 2.5 20.6	
LWR2	89-126cm	-9.4 to -9.9		**SP**	Well-sorted, fine sand that is dark yellow with pockets of well-sorted very fine sand that is grayish-brown. Abundant shells present (<0.4cm)	Dark yellow	0.23 36.3/58.7/5/0 5 20.6	
LWR2	126-143cm	-10.4 to -10.9		**SP**	Sand with a large pocket of silt and few small pebbles. Some color modeling present	Yellow Beige	0.25 0/91/7.5/1.5 9 18.2	
LWR2	143-164cm	-11.4		**SP**	Coarse well-sorted sand with a large shell present (<3cm)	Yellow Beige	0.24 0/96/3/1 4 17.7	
LWR2	**Core**				**End of Core 2**			

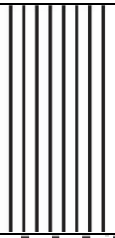
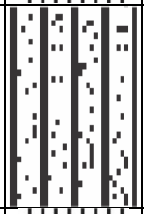
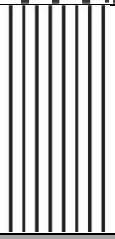
Little Wicomico Core 3 Latitude: 37.8892 Longitude: -76.2483 Date: 3/9/2025

Section	Depth (ft)	Depth Below Sediment Surface MLLW (ft)	Graphic	USCS Soil Type	Description	Color	Grain Size %G/SD/S/C %Fines %Moisture	Comments
LWR3B	0-116 cm	-9.3 to -12.3		**SM**	Comprised of sticky gray clay with some small speckles (<0.1mm) of biogenic dark black material	Brownish-gray	0.03 0/44/51/5 56 47.5	
LWR3B	116-150cm	-12.8 to -13.7		**ML**	Comprised of sticky gray clay with some small speckles of biogenic dark black material (<0.1mm) with some mottling present	Brownish-gray	0.02 0/32/62/6 68 44.7	
Core	**3B**				**End of Core 3B**			

Little Wicomico Core 4 Latitude: 37.8895 Longitude: -76.2507 Date: 3/9/2025

Section	Depth (ft)	Depth Below Sediment Surface MLLW (ft)	Graphic	USCS Soil Type	Description	Color	Grain Size %G/SD/S/C %Fines %Moisture	Comments
LWR4A	0-19cm	-9.1		**SM**	Well-sorted, fine brown sand with pockets of well-sorted very fine sand that is dark black.	Dark brown gray	0.08 0/74/23/2 26 33.5	
LWR4A	19-46 cm	-9.1 to -10.1		**SM**	Well-sorted, fine brown sand with large pockets of well-sorted, very fine sand of the same color. Some shells present (>2cm) with abundant very fine biogenic material (<1mm)	Dark brown gray	0.07 0/69/28/3 31 34.4	
LWR4A	46-54cm	-10.1		**SM**	Comprised of sticky clay and silt with sharp bottom contact	Dark gray	0.04 0/51/45/4 49 38.7	
LWR4A	54-69cm	-10.8		**SM**	Well-sorted, fine sand with abundant very fine biogenic material	Dark brown gray	0.09 0/79/18/2 21 24.7	
LWR4A	67-100 cm	-11.1 to -11.6		**ML**	Sticky clay with some shells (< 1cm)	Dark gray	0.03 0/48.5/48/4.5 51.5 44.5	
Core					**End of Section 4A (Core 4)**			

Little Wicomico Core 4 Latitude: 37.8895 Longitude: -76.2507 Date: 3/9/2025

Section	Depth (ft)	Depth Below Sediment Surface MLLW (ft)	Graphic	USCS Soil Type	Description	Color	Grain Size %G/SD/S/C %Fines %Moisture	Comments
LWR4B	100-207cm	-12.4 to -14.9		ML	Well-sorted, sticky clay with minimal biogenic material (<1mm). Some mottling, both very similar colors. Large oyster shell present at 193cm	Dark gray	0.03 0/40.8/54.3/4.83 59.2 40.88	
LWR4B	207-218cm	-15.4		SM	Very fine sand intermixed with silt and clay. Large shell and some smaller shells (<0.4cm) present	Dark gray	0.03 0/46/49/5 54 38.2	
LWR4B	218-250cm	-15.9 to -16.8		ML	Sticky gray clay, well-sorted with some	Dark gray	0.03 0/41.3/53.3/5.3 59 40.3	
Core					**End of Core 4 (Sections A&B)**			

Little Wicomico Core 5 Latitude: 37.8899 Longitude: -76.2361 Date: 3/9/2025

Section	Depth (ft)	Depth Below Sediment Surface MLLW (ft)	Graphic	USCS Soil Type	Description	Color	Grain Size %G/SD/S/C %Fines %Moisture	Comments
LWR5	0-2.96	-2.1			(Grab Sample)		1.70 10/89/0/0 0 14.8	Core was too coarse to collect Vibracore sample.
Core	**2.95**				**End of Core**			

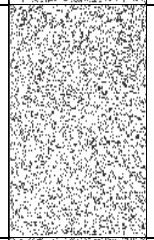
Little Wicomico Core 6 Latitude: 37.8896 Longitude: -76.2372 Date: 3/9/2025

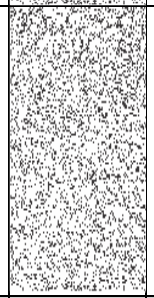
Section	Depth (ft)	Depth Below Sediment Surface MLLW (ft)	Graphic	USCS Soil Type	Description	Color	Grain Size %G/SD/S/C %Fines %Moisture	Comments
LWR6	0-2.82	-3.2			(Grab Sample)		1.66 5/94/0/0 0 16.3	Core was too coarse to collect Vibracore sample.
Core	**2.82**				**End of Core**			

Little Wicomico Core 7 Latitude: 37.8892 Longitude: -76.2379 Date: 3/9/2025

Section	Depth (ft)	Depth Below Sediment Surface MLLW (ft)	Graphic	USCS Soil Type	Description	Color	Grain Size %G/SD/S/C %Fines %Moisture	Comments
LWR7	0-1.94	-4.7			(Grab Sample)		1.14 1//99/0/0 1 13.4	Core was too coarse to collect Vibracore sample.
Core	**1.94**				**End of Core**			

Little Wicomico Core 8 Latitude: 37.8895 Longitude: -76.2376 Date: 3/9/2025

Section	Depth (ft)	Depth Below Sediment Surface MLLW (ft)	Graphic	USCS Soil Type	Description	Color	Grain Size %G/SD/S/C %Fines %Moisture	Comments
LWR8	0-17cm	-9.2		**SP**	Poorly sorted VCS and pebbles with some shell and wood fragments present	Light brown	1.02 10/90/0/0 1 12.1	
LWR8	17-72cm	-9.7 to -11.1		**SP**	Subangular VCS with rounded pebbles and gravel. Some shells and organic matter as well as mottling present. Large oyster shell at 36-41cm	Dark gray	1.08 13/87/0/0 0.25 11.2	
LWR8	72-82cm	-11.4		**SP**	VCS and CS as well as shells present with a large chunk of wood	Dark gray	1.02 4/95/1/0 1 10.7	
LWR8	82-91cm	-11.7		**SP**	VCS and CS with wood fragments and shells (3.5cm). Oxidized black wood present at 88-91cm	Dark gray	1.87 0/91/1/0 1 13.4	
LWR8	91-95cm	-12.0		**SP**	FM/MS/CS with small shell fragments and some organic material present	Gray	0.59 1/98/1/0 1 18.4	

Little Wicomico Core 8	Latitude: 37.8895	Longitude: -76.2376	Date: 3/9/2025					
LWR8	95-96cm	-12.15		**SP**	MS/CS/VCS with somewhat coarser sand and lighter color	Gray	0.59 1/98/1/0 1 18.4	
LWR8	96-111cm	-12.3		**SP**	FS/MS/CS/VCS with shell hash and small wood fragments (0.5cm) as well as a large black piece of wood (7cm)	Gray	0.50 1/96/2/1 3 19.0	
LWR8	111-117cm	-12.6		**SP**	Coarsening upward from VFS/Silt to CS/VCS with color transition upward black and yellow to green-gray	Dark Gray	0.55 1/98/1/0 1 21.8	
LWR8	117-145cm	-12.8 to -13.3		**SP**	Gradual coarsening upwards from silt/VFS at 145cm, VFS/FS/MS at 130cm, and FS/MS/CS at 117cm. Organic layers at 134-136cm with small organic material (0.4cm) at 125 cm	Gray	0.27 0/96/2.5/1 4 17.8	
Core					**End of Core 8**			

Appendix C

Sediment Data

Sample_ID	% Gravel	% Sand	% Silt	% Clay	% Mud	D50 (mm)
Core 1	0	98	1	1	2	0.33
Core 2	0	91	7	2	9	0.20
Core 3^	0	24	65	11	76	0.02
Core 4^	0	70	26	4	30	0.10
Core 5	0	76	21	3	24	0.68
Core 6	0	99	1	0	1	0.75
Core 7	0	99	1	0	1	0.56
Core 8	0	99	1	0	1	0.59
Placement_HWL	0	100	0	0	0	1.08
Placement_TOE	1	99	0	0	0	1.50

^Sediment is not being used for shore placement

Appendix D

Chemical Analyses

1941 Reymet Road ● Richmond, Virginia 23230 ● Tel: (804)-358-8295 Fax: (804)-358-8297

Certificate of Analysis

Final Report

Client Name:	Virginia Institute of Marine Science 1370 Greate Road Gloucester VA, 23062-1346	Date Issued: Project Number: Purchase Order:	September 12, 2025 18:09 [none]
Submitted To:	Julianna Kowal		
Client Site I.D.:	2025 Marine Sediment Testing		

ANALYTICAL REPORT FOR SAMPLES

Laboratory Order ID 25I0459

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
LWR1	25I0459-01	Solids	09/03/2025 12:00	09/05/2025 11:47
LWR2	25I0459-02	Solids	09/03/2025 12:00	09/05/2025 11:47
CC1	25I0459-03	Solids	09/03/2025 14:00	09/05/2025 11:47
CC2	25I0459-04	Solids	09/03/2025 14:00	09/05/2025 11:47
WC1	25I0459-05	Solids	09/04/2025 11:00	09/05/2025 11:47
WC2	25I0459-06	Solids	09/04/2025 11:00	09/05/2025 11:47

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Certificate of Analysis

Final Report

Client Name:	Virginia Institute of Marine Science 1370 Greate Road Gloucester VA, 23062-1346	Date Issued: Project Number: Purchase Order:	September 12, 2025 18:09 [none]
Submitted To:	Julianna Kowal		
Client Site I.D.:	2025 Marine Sediment Testing		

Laboratory Order ID: 25I0459

Analytical Results

Sample I.D. LWR1 **Laboratory Sample ID:** 25I0459-01

Grab Date/Time: 09/03/2025 12:00

Field Residual Cl: **Field pH:**

Parameter	Samp ID	Method	Result	Qual	Reporting Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
TCLP Metals by 6000/7000 Series Methods									
TCLP Silver	01	SW6010D	<0.100 mg/L		0.100	1	09/09/25 10:45	09/10/25 13:15	NBT
TCLP Arsenic	01	SW6010D	<0.100 mg/L		0.100	1	09/09/25 10:45	09/10/25 13:15	NBT
TCLP Barium	01	SW6010D	<5.00 mg/L		5.00	1	09/09/25 10:45	09/10/25 13:15	NBT
TCLP Cadmium	01	SW6010D	<0.0400 mg/L		0.0400	1	09/09/25 10:45	09/10/25 13:15	NBT
TCLP Chromium	01	SW6010D	<0.100 mg/L		0.100	1	09/09/25 10:45	09/10/25 13:15	NBT
TCLP Mercury	01	SW7470A	<0.008 mg/L		0.008	1	09/11/25 07:32	09/11/25 12:17	TBHW
TCLP Lead	01	SW6010D	<0.100 mg/L		0.100	1	09/09/25 10:45	09/10/25 13:15	NBT
TCLP Selenium	01	SW6010D	<0.250 mg/L		0.250	1	09/09/25 10:45	09/10/25 13:15	NBT
TCLP Extraction Fluid, Metals	01	SW1311	**1 #**		--	1	09/08/25 15:45	09/08/25 15:45	ESW
TCLP Volatile Organic Compounds by GCMS									
TCLP Extraction Fluid, ZHE	01	SW1311	**1 #**		--	1	09/09/25 15:00	09/10/25 14:18	TLC
TCLP 1,1-Dichloroethylene	01	SW8260D	<0.02 mg/L		0.02	1	09/10/25 14:43	09/10/25 14:43	JWR
TCLP 1,2-Dichloroethane	01	SW8260D	<0.02 mg/L		0.02	1	09/10/25 14:43	09/10/25 14:43	JWR
TCLP 1,4-Dichlorobenzene	01	SW8260D	<0.02 mg/L		0.02	1	09/10/25 14:43	09/10/25 14:43	JWR
TCLP 2-Butanone (MEK)	01	SW8260D	<0.20 mg/L	C	0.20	1	09/10/25 14:43	09/10/25 14:43	JWR
TCLP Benzene	01	SW8260D	<0.05 mg/L		0.05	1	09/10/25 14:43	09/10/25 14:43	JWR
TCLP Carbon tetrachloride	01	SW8260D	<0.02 mg/L		0.02	1	09/10/25 14:43	09/10/25 14:43	JWR
TCLP Chlorobenzene	01	SW8260D	<0.02 mg/L		0.02	1	09/10/25 14:43	09/10/25 14:43	JWR
TCLP Chloroform	01	SW8260D	<0.02 mg/L		0.02	1	09/10/25 14:43	09/10/25 14:43	JWR
TCLP Tetrachloroethylene (PCE)	01	SW8260D	<0.05 mg/L		0.05	1	09/10/25 14:43	09/10/25 14:43	JWR
TCLP Trichloroethylene	01	SW8260D	<0.02 mg/L		0.02	1	09/10/25 14:43	09/10/25 14:43	JWR
TCLP Vinyl chloride	01	SW8260D	<0.02 mg/L		0.02	1	09/10/25 14:43	09/10/25 14:43	JWR
Surr: 1,2-Dichloroethane-d4 (Surr)	*01*	*SW8260D*	*110 %*		*70-120*		*09/10/25 14:43*	*09/10/25 14:43*	*JWR*

ENTHALPY ANALYTICAL

1941 Reymet Road ● Richmond, Virginia 23230 ● Tel: (804)-358-8295 Fax: (804)-358-8297

Certificate of Analysis

Final Report

Client Name:	Virginia Institute of Marine Science 1370 Greate Road Gloucester VA, 23062-1346	Date Issued: Project Number: Purchase Order:	September 12, 2025 18:09 [none]
Submitted To:	Julianna Kowal		
Client Site I.D.:	2025 Marine Sediment Testing		

Laboratory Order ID: 25I0459

Analytical Results

Sample I.D. LWR1 **Laboratory Sample ID:** 25I0459-01

Grab Date/Time: 09/03/2025 12:00

Field Residual Cl: **Field pH:**

Parameter	Samp ID	Method	Result	Qual	Reporting Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
TCLP Volatile Organic Compounds by GCMS									
Surr: 4-Bromofluorobenzene (Surr)	*01*	*SW8260D*	*96.7 %*		*75-120*		*09/10/25 14:43*	*09/10/25 14:43*	*JWR*
Surr: Dibromofluoromethane (Surr)	*01*	*SW8260D*	*105 %*		*80-119*		*09/10/25 14:43*	*09/10/25 14:43*	*JWR*
Surr: Toluene-d8 (Surr)	*01*	*SW8260D*	*98.7 %*		*85-120*		*09/10/25 14:43*	*09/10/25 14:43*	*JWR*
Volatile Organic Compounds by GC									
Methyl-t-butyl ether (MTBE)	01RE1	SW8021B	<24.8 ug/kg		24.8	1	09/09/25 13:45	09/09/25 13:45	JWR
Benzene	01RE1	SW8021B	<24.8 ug/kg		24.8	1	09/09/25 13:45	09/09/25 13:45	JWR
Toluene	01RE1	SW8021B	<24.8 ug/kg		24.8	1	09/09/25 13:45	09/09/25 13:45	JWR
Ethylbenzene	01RE1	SW8021B	<24.8 ug/kg		24.8	1	09/09/25 13:45	09/09/25 13:45	JWR
m+p-Xylenes	01RE1	SW8021B	<49.5 ug/kg		49.5	1	09/09/25 13:45	09/09/25 13:45	JWR
o-Xylene	01RE1	SW8021B	<24.8 ug/kg		24.8	1	09/09/25 13:45	09/09/25 13:45	JWR
Xylenes, Total	01RE1	SW8021B	<74.3 ug/kg		74.3	1	09/09/25 13:45	09/09/25 13:45	JWR
Surr: 2,5-Dibromotoluene (Surr PID)	*01RE1*	*SW8021B*	*101 %*		*80-120*		*09/09/25 13:45*	*09/09/25 13:45*	*JWR*
Semivolatile Hydrocarbons by GC									
TPH-Semi-Volatiles (DRO)	01	SW8015C	<10.0 mg/kg		10.0	1	09/08/25 12:20	09/09/25 12:03	TEG
Surr: n-Triacontane (Surr)	*01*	*SW8015C*	*40.0 %*	*S*	*50-125*		*09/08/25 12:20*	*09/09/25 12:03*	*TEG*
TCLP Semivolatile Organic Compounds									
TCLP Extraction Fluid, SV Organics	01	SW1311	**1 #**		--	1	09/08/25 15:45	09/09/25 10:05	ATG
TCLP Semivolatile Organic Compounds by GCMS									
TCLP 2,4,5-Trichlorophenol	01	SW8270E	<0.10 mg/L		0.10	1	09/09/25 08:11	09/09/25 16:45	BMS
TCLP 2,4,6-Trichlorophenol	01	SW8270E	<0.10 mg/L		0.10	1	09/09/25 08:11	09/09/25 16:45	BMS
TCLP 2,4-Dinitrotoluene	01	SW8270E	<0.10 mg/L		0.10	1	09/09/25 08:11	09/09/25 16:45	BMS

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Certificate of Analysis

Final Report

Client Name:	Virginia Institute of Marine Science 1370 Greate Road Gloucester VA, 23062-1346	Date Issued: Project Number: Purchase Order:	September 12, 2025 18:09 [none]
Submitted To:	Julianna Kowal		
Client Site I.D.:	2025 Marine Sediment Testing		

Laboratory Order ID: 25I0459

Analytical Results

Sample I.D. LWR1 **Laboratory Sample ID:** 25I0459-01

Grab Date/Time: 09/03/2025 12:00

Field Residual Cl: **Field pH:**

Parameter	Samp ID	Method	Result	Qual	Reporting Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
TCLP Semivolatile Organic Compounds by GCMS									
TCLP Hexachlorobenzene	01	SW8270E	<0.10 mg/L		0.10	1	09/09/25 08:11	09/09/25 16:45	BMS
TCLP Hexachlorobutadiene	01	SW8270E	<0.10 mg/L		0.10	1	09/09/25 08:11	09/09/25 16:45	BMS
TCLP Hexachloroethane	01	SW8270E	<0.10 mg/L		0.10	1	09/09/25 08:11	09/09/25 16:45	BMS
TCLP m+p-Cresols	01	SW8270E	<0.10 mg/L		0.10	1	09/09/25 08:11	09/09/25 16:45	BMS
TCLP Nitrobenzene	01	SW8270E	<0.10 mg/L		0.10	1	09/09/25 08:11	09/09/25 16:45	BMS
TCLP o+m+p-Cresols	01	SW8270E	<0.50 mg/L		0.50	1	09/09/25 08:11	09/09/25 16:45	BMS
TCLP o-Cresol	01	SW8270E	<0.10 mg/L		0.10	1	09/09/25 08:11	09/09/25 16:45	BMS
TCLP Pentachlorophenol	01	SW8270E	<0.10 mg/L		0.10	1	09/09/25 08:11	09/09/25 16:45	BMS
TCLP Pyridine	01	SW8270E	<0.10 mg/L		0.10	1	09/09/25 08:11	09/09/25 16:45	BMS
Surr: 2,4,6-Tribromophenol (Surr)	*01*	*SW8270E*	*59.6 %*		*7-150*		*09/09/25 08:11*	*09/09/25 16:45*	*BMS*
Surr: 2-Fluorobiphenyl (Surr)	*01*	*SW8270E*	*56.9 %*		*5-125*		*09/09/25 08:11*	*09/09/25 16:45*	*BMS*
Surr: 2-Fluorophenol (Surr)	*01*	*SW8270E*	*40.7 %*		*5-80*		*09/09/25 08:11*	*09/09/25 16:45*	*BMS*
Surr: Nitrobenzene-d5 (Surr)	*01*	*SW8270E*	*60.3 %*		*5-117*		*09/09/25 08:11*	*09/09/25 16:45*	*BMS*
Surr: Phenol-d5 (Surr)	*01*	*SW8270E*	*27.4 %*		*5-60*		*09/09/25 08:11*	*09/09/25 16:45*	*BMS*
Surr: p-Terphenyl-d14 (Surr)	*01*	*SW8270E*	*65.9 %*		*19.3-150*		*09/09/25 08:11*	*09/09/25 16:45*	*BMS*
Organochlorine Pesticides and PCBs by GC/ECD									
PCB as Aroclor 1016	01	SW8082A	<0.140 mg/kg dry		0.140	1	09/08/25 10:00	09/09/25 04:08	ZDR
PCB as Aroclor 1221	01	SW8082A	<0.140 mg/kg dry		0.140	1	09/08/25 10:00	09/09/25 04:08	ZDR
PCB as Aroclor 1232	01	SW8082A	<0.140 mg/kg dry		0.140	1	09/08/25 10:00	09/09/25 04:08	ZDR
PCB as Aroclor 1242	01	SW8082A	<0.140 mg/kg dry		0.140	1	09/08/25 10:00	09/09/25 04:08	ZDR
PCB as Aroclor 1248	01	SW8082A	<0.140 mg/kg dry		0.140	1	09/08/25 10:00	09/09/25 04:08	ZDR
PCB as Aroclor 1254	01	SW8082A	<0.140 mg/kg dry		0.140	1	09/08/25 10:00	09/09/25 04:08	ZDR
PCB as Aroclor 1260	01	SW8082A	<0.140 mg/kg dry		0.140	1	09/08/25 10:00	09/09/25 04:08	ZDR
Surr: DCB	*01*	*SW8082A*	*75.0 %*		*30-105*		*09/08/25 10:00*	*09/09/25 04:08*	*ZDR*
Surr: TCMX	*01*	*SW8082A*	*85.0 %*		*30-105*		*09/08/25 10:00*	*09/09/25 04:08*	*ZDR*

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Client Site I.D.:	2025 Marine Sediment Testing		

Laboratory Order ID: 25I0459

Analytical Results

Sample I.D. LWR1 **Laboratory Sample ID:** 25I0459-01

Grab Date/Time: 09/03/2025 12:00

Field Residual Cl: **Field pH:**

Parameter	Samp ID	Method	Result	Qual	Reporting Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
TCLP Organochlorine Herbicides by GC/ECD									
TCLP 2,4,5-TP (Silvex)	01	SW8151A	<0.0005 mg/L		0.0005	1	09/09/25 13:15	09/10/25 15:24	BMS
TCLP 2,4-D	01	SW8151A	<0.001 mg/L		0.001	1	09/09/25 13:15	09/10/25 15:24	BMS
Surr: DCAA (Surr)	*01*	*SW8151A*	*79.0 %*		*48.5-134*		*09/09/25 13:15*	*09/10/25 15:24*	*BMS*
TCLP Organochlorine Pesticides and PCBs by GC/ECD									
TCLP Chlordane	01	SW8081B	<0.030 mg/L		0.030	1	09/09/25 15:50	09/10/25 18:42	ZDR
TCLP Endrin	01	SW8081B	<0.005 mg/L		0.005	1	09/09/25 15:50	09/10/25 18:42	ZDR
TCLP gamma-BHC (Lindane)	01	SW8081B	<0.005 mg/L		0.005	1	09/09/25 15:50	09/10/25 18:42	ZDR
TCLP Heptachlor	01	SW8081B	<0.005 mg/L		0.005	1	09/09/25 15:50	09/10/25 18:42	ZDR
TCLP Heptachlor Epoxide	01	SW8081B	<0.005 mg/L		0.005	1	09/09/25 15:50	09/10/25 18:42	ZDR
TCLP Methoxychlor	01	SW8081B	<0.005 mg/L		0.005	1	09/09/25 15:50	09/10/25 18:42	ZDR
TCLP Toxaphene	01	SW8081B	<0.500 mg/L		0.500	1	09/09/25 15:50	09/10/25 18:42	ZDR
Surr: TCMX	*01*	*SW8081B*	*75.0 %*		*18-112*		*09/09/25 15:50*	*09/10/25 18:42*	*ZDR*
Surr: DCB	*01*	*SW8081B*	*85.0 %*		*27-131*		*09/09/25 15:50*	*09/10/25 18:42*	*ZDR*
Wet Chemistry Analysis									
Percent Solids	01	SM2540G-2020	**69.5 %**		0.10	1	09/10/25 09:42	09/10/25 09:42	SMB

ENTHALPY ANALYTICAL

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Submitted To:	Julianna Kowal		
Client Site I.D.:	2025 Marine Sediment Testing		

Laboratory Order ID: 25I0459

Analytical Results

Sample I.D. LWR2 **Laboratory Sample ID:** 25I0459-02

Grab Date/Time: 09/03/2025 12:00

Field Residual Cl: **Field pH:**

Parameter	Samp ID	Method	Result	Qual	Reporting Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
TCLP Metals by 6000/7000 Series Methods									
TCLP Silver	02	SW6010D	<0.100 mg/L		0.100	1	09/09/25 10:45	09/10/25 13:23	NBT
TCLP Arsenic	02	SW6010D	<0.100 mg/L		0.100	1	09/09/25 10:45	09/10/25 13:23	NBT
TCLP Barium	02	SW6010D	<5.00 mg/L		5.00	1	09/09/25 10:45	09/10/25 13:23	NBT
TCLP Cadmium	02	SW6010D	<0.0400 mg/L		0.0400	1	09/09/25 10:45	09/10/25 13:23	NBT
TCLP Chromium	02	SW6010D	<0.100 mg/L		0.100	1	09/09/25 10:45	09/10/25 13:23	NBT
TCLP Mercury	02	SW7470A	<0.008 mg/L		0.008	1	09/11/25 07:32	09/11/25 12:23	TBHW
TCLP Lead	02	SW6010D	<0.100 mg/L		0.100	1	09/09/25 10:45	09/10/25 13:23	NBT
TCLP Selenium	02	SW6010D	<0.250 mg/L		0.250	1	09/09/25 10:45	09/10/25 13:23	NBT
TCLP Extraction Fluid, Metals	02	SW1311	**1 #**		--	1	09/08/25 15:45	09/08/25 15:45	ESW
TCLP Volatile Organic Compounds by GCMS									
TCLP Extraction Fluid, ZHE	02	SW1311	**1 #**		--	1	09/09/25 15:00	09/10/25 14:18	TLC
TCLP 1,1-Dichloroethylene	02	SW8260D	<0.02 mg/L		0.02	1	09/10/25 15:07	09/10/25 15:07	JWR
TCLP 1,2-Dichloroethane	02	SW8260D	<0.02 mg/L		0.02	1	09/10/25 15:07	09/10/25 15:07	JWR
TCLP 1,4-Dichlorobenzene	02	SW8260D	<0.02 mg/L		0.02	1	09/10/25 15:07	09/10/25 15:07	JWR
TCLP 2-Butanone (MEK)	02	SW8260D	<0.20 mg/L	C	0.20	1	09/10/25 15:07	09/10/25 15:07	JWR
TCLP Benzene	02	SW8260D	<0.05 mg/L		0.05	1	09/10/25 15:07	09/10/25 15:07	JWR
TCLP Carbon tetrachloride	02	SW8260D	<0.02 mg/L		0.02	1	09/10/25 15:07	09/10/25 15:07	JWR
TCLP Chlorobenzene	02	SW8260D	<0.02 mg/L		0.02	1	09/10/25 15:07	09/10/25 15:07	JWR
TCLP Chloroform	02	SW8260D	<0.02 mg/L		0.02	1	09/10/25 15:07	09/10/25 15:07	JWR
TCLP Tetrachloroethylene (PCE)	02	SW8260D	<0.05 mg/L		0.05	1	09/10/25 15:07	09/10/25 15:07	JWR
TCLP Trichloroethylene	02	SW8260D	<0.02 mg/L		0.02	1	09/10/25 15:07	09/10/25 15:07	JWR
TCLP Vinyl chloride	02	SW8260D	<0.02 mg/L		0.02	1	09/10/25 15:07	09/10/25 15:07	JWR
Surr: 1,2-Dichloroethane-d4 (Surr)	*02*	*SW8260D*	*105 %*		*70-120*		*09/10/25 15:07*	*09/10/25 15:07*	*JWR*

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Submitted To:	Julianna Kowal		
Client Site I.D.:	2025 Marine Sediment Testing		

Laboratory Order ID: 25I0459

Analytical Results

Sample I.D. LWR2 **Laboratory Sample ID:** 25I0459-02

Grab Date/Time: 09/03/2025 12:00

Field Residual Cl: **Field pH:**

Parameter	Samp ID	Method	Result	Qual	Reporting Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
TCLP Volatile Organic Compounds by GCMS									
Surr: 4-Bromofluorobenzene (Surr)	*02*	*SW8260D*	*96.6 %*		*75-120*		*09/10/25 15:07*	*09/10/25 15:07*	*JWR*
Surr: Dibromofluoromethane (Surr)	*02*	*SW8260D*	*103 %*		*80-119*		*09/10/25 15:07*	*09/10/25 15:07*	*JWR*
Surr: Toluene-d8 (Surr)	*02*	*SW8260D*	*101 %*		*85-120*		*09/10/25 15:07*	*09/10/25 15:07*	*JWR*
Volatile Organic Compounds by GC									
Methyl-t-butyl ether (MTBE)	02	SW8021B	<5.00 ug/kg		5.00	1	09/05/25 18:49	09/05/25 18:49	JWR
Benzene	02	SW8021B	<5.00 ug/kg		5.00	1	09/05/25 18:49	09/05/25 18:49	JWR
Toluene	02	SW8021B	<5.00 ug/kg		5.00	1	09/05/25 18:49	09/05/25 18:49	JWR
Ethylbenzene	02	SW8021B	<5.00 ug/kg		5.00	1	09/05/25 18:49	09/05/25 18:49	JWR
m+p-Xylenes	02	SW8021B	<10.0 ug/kg		10.0	1	09/05/25 18:49	09/05/25 18:49	JWR
o-Xylene	02	SW8021B	<5.00 ug/kg		5.00	1	09/05/25 18:49	09/05/25 18:49	JWR
Xylenes, Total	02	SW8021B	<15.0 ug/kg		15.0	1	09/05/25 18:49	09/05/25 18:49	JWR
Surr: 2,5-Dibromotoluene (Surr PID)	*02*	*SW8021B*	*97.8 %*		*80-120*		*09/05/25 18:49*	*09/05/25 18:49*	*JWR*
Semivolatile Hydrocarbons by GC									
TPH-Semi-Volatiles (DRO)	02	SW8015C	<10.0 mg/kg		10.0	1	09/08/25 12:20	09/09/25 16:00	TEG
Surr: n-Triacontane (Surr)	*02*	*SW8015C*	*54.6 %*		*50-125*		*09/08/25 12:20*	*09/09/25 16:00*	*TEG*
TCLP Semivolatile Organic Compounds									
TCLP Extraction Fluid, SV Organics	02	SW1311	**1 #**		--	1	09/08/25 15:45	09/09/25 10:05	ATG
TCLP Semivolatile Organic Compounds by GCMS									
TCLP 2,4,5-Trichlorophenol	02	SW8270E	<0.10 mg/L		0.10	1	09/09/25 08:11	09/09/25 17:17	BMS
TCLP 2,4,6-Trichlorophenol	02	SW8270E	<0.10 mg/L		0.10	1	09/09/25 08:11	09/09/25 17:17	BMS
TCLP 2,4-Dinitrotoluene	02	SW8270E	<0.10 mg/L		0.10	1	09/09/25 08:11	09/09/25 17:17	BMS

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Field Residual Cl: **Field pH:**

Parameter	Samp ID	Method	Result	Qual	Reporting Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
TCLP Semivolatile Organic Compounds by GCMS									
TCLP Hexachlorobenzene	02	SW8270E	<0.10 mg/L		0.10	1	09/09/25 08:11	09/09/25 17:17	BMS
TCLP Hexachlorobutadiene	02	SW8270E	<0.10 mg/L		0.10	1	09/09/25 08:11	09/09/25 17:17	BMS
TCLP Hexachloroethane	02	SW8270E	<0.10 mg/L		0.10	1	09/09/25 08:11	09/09/25 17:17	BMS
TCLP m+p-Cresols	02	SW8270E	<0.10 mg/L		0.10	1	09/09/25 08:11	09/09/25 17:17	BMS
TCLP Nitrobenzene	02	SW8270E	<0.10 mg/L		0.10	1	09/09/25 08:11	09/09/25 17:17	BMS
TCLP o+m+p-Cresols	02	SW8270E	<0.50 mg/L		0.50	1	09/09/25 08:11	09/09/25 17:17	BMS
TCLP o-Cresol	02	SW8270E	<0.10 mg/L		0.10	1	09/09/25 08:11	09/09/25 17:17	BMS
TCLP Pentachlorophenol	02	SW8270E	<0.10 mg/L		0.10	1	09/09/25 08:11	09/09/25 17:17	BMS
TCLP Pyridine	02	SW8270E	<0.10 mg/L		0.10	1	09/09/25 08:11	09/09/25 17:17	BMS
Surr: 2,4,6-Tribromophenol (Surr)	*02*	*SW8270E*	*55.7 %*		*7-150*		*09/09/25 08:11*	*09/09/25 17:17*	*BMS*
Surr: 2-Fluorobiphenyl (Surr)	*02*	*SW8270E*	*47.9 %*		*5-125*		*09/09/25 08:11*	*09/09/25 17:17*	*BMS*
Surr: 2-Fluorophenol (Surr)	*02*	*SW8270E*	*27.6 %*		*5-80*		*09/09/25 08:11*	*09/09/25 17:17*	*BMS*
Surr: Nitrobenzene-d5 (Surr)	*02*	*SW8270E*	*51.7 %*		*5-117*		*09/09/25 08:11*	*09/09/25 17:17*	*BMS*
Surr: Phenol-d5 (Surr)	*02*	*SW8270E*	*24.9 %*		*5-60*		*09/09/25 08:11*	*09/09/25 17:17*	*BMS*
Surr: p-Terphenyl-d14 (Surr)	*02*	*SW8270E*	*62.6 %*		*19.3-150*		*09/09/25 08:11*	*09/09/25 17:17*	*BMS*
Organochlorine Pesticides and PCBs by GC/ECD									
PCB as Aroclor 1016	02	SW8082A	<0.141 mg/kg dry		0.141	1	09/08/25 10:00	09/09/25 04:28	ZDR
PCB as Aroclor 1221	02	SW8082A	<0.141 mg/kg dry		0.141	1	09/08/25 10:00	09/09/25 04:28	ZDR
PCB as Aroclor 1232	02	SW8082A	<0.141 mg/kg dry		0.141	1	09/08/25 10:00	09/09/25 04:28	ZDR
PCB as Aroclor 1242	02	SW8082A	<0.141 mg/kg dry		0.141	1	09/08/25 10:00	09/09/25 04:28	ZDR
PCB as Aroclor 1248	02	SW8082A	<0.141 mg/kg dry		0.141	1	09/08/25 10:00	09/09/25 04:28	ZDR
PCB as Aroclor 1254	02	SW8082A	<0.141 mg/kg dry		0.141	1	09/08/25 10:00	09/09/25 04:28	ZDR
PCB as Aroclor 1260	02	SW8082A	<0.141 mg/kg dry		0.141	1	09/08/25 10:00	09/09/25 04:28	ZDR
Surr: DCB	*02*	*SW8082A*	*120 %*	*S*	*30-105*		*09/08/25 10:00*	*09/09/25 04:28*	*ZDR*
Surr: TCMX	*02*	*SW8082A*	*145 %*	*S*	*30-105*		*09/08/25 10:00*	*09/09/25 04:28*	*ZDR*

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Laboratory Order ID: 25I0459

Analytical Results

Sample I.D. LWR2 **Laboratory Sample ID:** 25I0459-02

Grab Date/Time: 09/03/2025 12:00

Field Residual Cl: **Field pH:**

Parameter	Samp ID	Method	Result	Qual	Reporting Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
TCLP Organochlorine Herbicides by GC/ECD									
TCLP 2,4,5-TP (Silvex)	02	SW8151A	<0.0005 mg/L		0.0005	1	09/09/25 13:15	09/10/25 15:46	BMS
TCLP 2,4-D	02	SW8151A	<0.001 mg/L		0.001	1	09/09/25 13:15	09/10/25 15:46	BMS
Surr: DCAA (Surr)	*02*	*SW8151A*	*61.6 %*		*48.5-134*		*09/09/25 13:15*	*09/10/25 15:46*	*BMS*
TCLP Organochlorine Pesticides and PCBs by GC/ECD									
TCLP Chlordane	02	SW8081B	<0.030 mg/L		0.030	1	09/09/25 15:50	09/10/25 19:02	ZDR
TCLP Endrin	02	SW8081B	<0.005 mg/L		0.005	1	09/09/25 15:50	09/10/25 19:02	ZDR
TCLP gamma-BHC (Lindane)	02	SW8081B	<0.005 mg/L		0.005	1	09/09/25 15:50	09/10/25 19:02	ZDR
TCLP Heptachlor	02	SW8081B	<0.005 mg/L		0.005	1	09/09/25 15:50	09/10/25 19:02	ZDR
TCLP Heptachlor Epoxide	02	SW8081B	<0.005 mg/L		0.005	1	09/09/25 15:50	09/10/25 19:02	ZDR
TCLP Methoxychlor	02	SW8081B	<0.005 mg/L		0.005	1	09/09/25 15:50	09/10/25 19:02	ZDR
TCLP Toxaphene	02	SW8081B	<0.500 mg/L		0.500	1	09/09/25 15:50	09/10/25 19:02	ZDR
Surr: TCMX	*02*	*SW8081B*	*65.0 %*		*18-112*		*09/09/25 15:50*	*09/10/25 19:02*	*ZDR*
Surr: DCB	*02*	*SW8081B*	*65.0 %*		*27-131*		*09/09/25 15:50*	*09/10/25 19:02*	*ZDR*
Wet Chemistry Analysis									
Percent Solids	02	SM2540G-2020	**69.5 %**		0.10	1	09/10/25 09:42	09/10/25 09:42	SMB

Appendix E

IPaC List

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Maryland and Virginia

Local offices

Chesapeake Bay Ecological Services Field Office

(410) 573-4599
(410) 266-9127

177 Admiral Cochrane Drive
Annapolis, MD 21401-7307

Virginia Ecological Services Field Office

(804) 693-6694

6669 Short Lane
Gloucester, VA 23061-4410

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. 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.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Tricolored Bat Perimyotis subflavus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

Insects

NAME	STATUS
Monarch Butterfly Danaus plexippus Wherever found There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/9743	Proposed Threatened
Northeastern Beach Tiger Beetle Habroscelimorpha dorsalis dorsalis Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8105	Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

You are still required to determine if your project(s) may have effects on all above listed species.

Bald & Golden Eagles

Bald and Golden Eagles are protected under the Bald and Golden Eagle Protection Act [2] and the Migratory Bird Treaty Act (MBTA) [1]. Any person or organization who plans or conducts activities that may result in impacts to Bald or Golden Eagles, or their habitats, should follow appropriate regulations and consider implementing appropriate avoidance and minimization measures, as described in the various links on this page.

Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide avoidance and minimization measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

There are Bald Eagles and/or Golden Eagles in your project area.

Measures for Proactively Minimizing Eagle Impacts
For information on how to best avoid and minimize disturbance to nesting bald eagles, please review the National Bald Eagle Management Guidelines. You may employ the timing and activity-specific distance recommendations in this document when designing your project/activity to avoid and minimize eagle impacts. For bald eagle information specific to Alaska, please refer to Bald Eagle Nesting and Sensitivity to Human Activity.

The FWS does not currently have guidelines for avoiding and minimizing disturbance to nesting Golden Eagles. For site-specific recommendations regarding nesting Golden Eagles, please consult with the appropriate Regional Migratory Bird Office or Ecological Services Field Office.

If disturbance or take of eagles cannot be avoided, an incidental take permit may be available to authorize any take that results from, but is not the purpose of, an otherwise lawful activity. For assistance making this determination for Bald Eagles, visit the Do I Need A Permit Tool. For assistance making this determination for golden eagles, please consult with the appropriate Regional Migratory Bird Office or Ecological Services Field Office.

Ensure Your Eagle List is Accurate and Complete
If your project area is in a poorly surveyed area in IPaC, your list may not be complete and you may need to rely on other resources to determine what species may be present (e.g. your local FWS field office, state surveys, your own surveys). Please review the Supplemental Information on Migratory Birds and Eagles, to help you properly interpret the report for your specified location, including determining if there is sufficient data to ensure your list is accurate.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to bald or golden eagles on your list, see the "Probability of Presence Summary" below to see when these bald or golden eagles are most likely to be present and breeding in your

project area.

Review the FAQs
The FAQs below provide important additional information and resources.

NAME	BREEDING SEASON
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. https://ecos.fws.gov/ecp/species/1626	Breeds Oct 15 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 "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "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.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

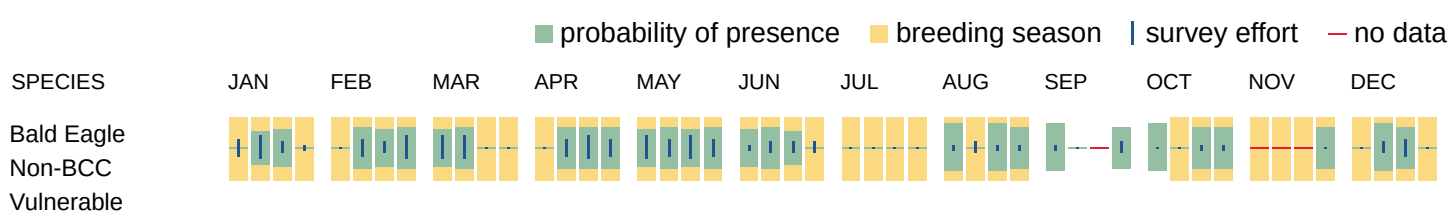
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

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.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

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.



Bald & Golden Eagles FAQs

What does IPaC use to generate the potential presence of bald and golden eagles in my specified location?

The potential for eagle presence 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 an eagle (Bald and Golden Eagle Protection Act requirements may apply).

Proper interpretation and use of your eagle report
On the graphs provided, please look carefully at the survey effort (indicated by the black vertical line) and for the existence of the "no data" indicator (a red horizontal line). 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 line or no data line (red horizontal) 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 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 and associated information help you know what to look for to confirm presence and helps guide you in knowing when to implement avoidance and minimization measures to eliminate or reduce potential impacts from your project activities or get the appropriate permits should presence be confirmed.

How do I know if eagles are 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 resident), you may query your location using the RAIL Tool and view the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If an eagle on your IPaC migratory bird species list has a breeding season associated with it (indicated by yellow vertical bars on the phenology graph in your “IPaC PROBABILITY OF PRESENCE SUMMARY” at the top of your results list), 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.

Interpreting the Probability of Presence Graphs

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 taller bar indicates a higher probability of species presence. The survey effort can be used to establish a level of confidence in the presence score.

How is the probability of presence score calculated? The calculation is done in three steps:
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.

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.

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.

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.

Migratory birds

The Migratory Bird Treaty Act (MBTA) [1] prohibits the take (including killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by the Department of Interior U.S. Fish and Wildlife Service (Service).

1. The Migratory Birds Treaty Act of 1918.

2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide avoidance and minimization measures for birds
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

Measures for Proactively Minimizing Migratory Bird Impacts

Your IPaC Migratory Bird list showcases birds of concern, including Birds of Conservation Concern (BCC), in your project location. This is not a comprehensive list of all birds found in your project area. However, you can help proactively minimize significant impacts to all birds at your project location by implementing the measures in the Nationwide avoidance and minimization measures for birds document, and any other project-specific avoidance and minimization measures suggested at the link Measures for avoiding and minimizing impacts to birds for the birds of concern on your list below.

Ensure Your Migratory Bird List is Accurate and Complete

If your project area is in a poorly surveyed area, your list may not be complete and you may need to rely on other resources to determine what species may be present (e.g. your local FWS field office, state surveys, your own surveys). Please review the Supplemental Information on Migratory Birds and Eagles document, to help you properly interpret the report for your specified location, including determining if there is sufficient data to ensure your list is accurate.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the "Probability of Presence Summary" below to see when these birds are most likely to be present and breeding in your project area.

Review the FAQs

The FAQs below provide important additional information and resources.

NAME	BREEDING SEASON
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. https://ecos.fws.gov/ecp/species/1626	Breeds Oct 15 to Aug 31
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
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. https://ecos.fws.gov/ecp/species/6034	Breeds Jan 15 to Sep 30
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 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

Double-crested Cormorant phalacrocorax auritus — Breeds Apr 20 to Aug 31

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

Eastern Whip-poor-will Antrostomus vociferus — Breeds May 1 to Aug 20

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Least Tern Sternula antillarum antillarum — Breeds Apr 25 to Sep 5

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Long-tailed Duck Clangula hyemalis — Breeds elsewhere

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

Prairie Warbler Setophaga discolor — Breeds May 1 to Jul 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Prothonotary Warbler Protonotaria citrea — Breeds Apr 1 to Jul 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Red-breasted Merganser Mergus serrator — Breeds elsewhere

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.

Red-headed Woodpecker Melanerpes erythrocephalus — Breeds May 10 to Sep 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Red-throated Loon Gavia stellata — Breeds elsewhere

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.

Ring-billed Gull Larus delawarensis — Breeds elsewhere

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.

Royal Tern Thalasseus maximus — Breeds Apr 15 to Aug 31

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.

Rusty Blackbird Euphagus carolinus — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Scarlet Tanager Piranga olivacea — Breeds May 10 to Aug 10

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Semipalmated Sandpiper Calidris pusilla This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	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
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 "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (▪)

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How is the probability of presence score calculated? The calculation is done in three steps:

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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.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

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.

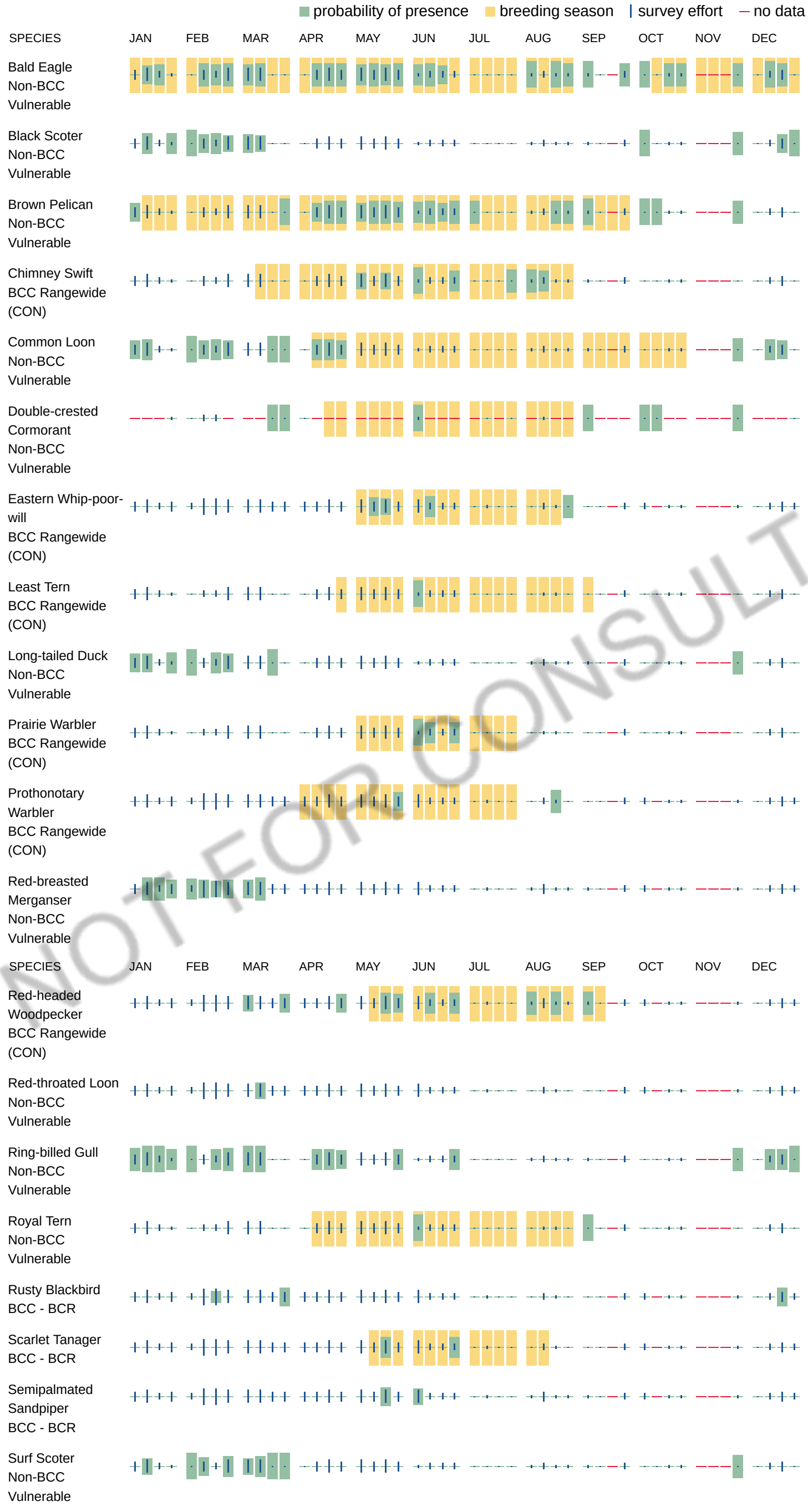
Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

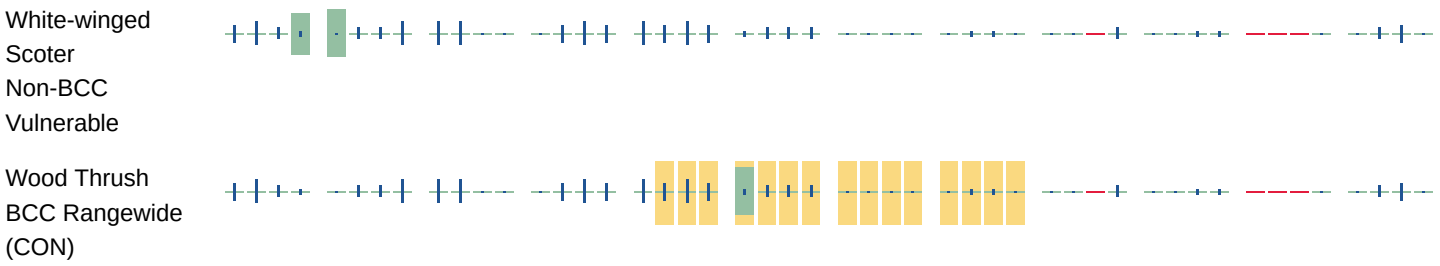
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

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.





Migratory Bird FAQs

Tell me more about avoidance and minimization measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Avoidance & Minimization Measures for Birds describes measures that can help avoid and minimize impacts to all birds at any location year-round. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is one of the most effective ways to minimize impacts. To see when birds are most likely to occur and breed 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 Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location, such as those listed under the Endangered Species Act or the Bald and Golden Eagle Protection Act and those species marked as “Vulnerable”. See the FAQ “What are the levels of concern for migratory birds?” for more information on the levels of concern covered in the IPaC migratory bird species list.

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) with which your project intersects. These species have been identified as warranting special attention because they are BCC species in that area, an eagle (Bald and Golden Eagle Protection 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, and to verify survey effort when no results present, please visit the Rapid Avian Information Locator (RAIL) Tool.

Why are subspecies showing up on my list?

Subspecies profiles are included on the list of species present in your project area because observations in the AKN for **the species** are being detected. If the species are present, that means that the subspecies may also be present. If a subspecies shows up on your list, you may need to rely on other resources to determine if that subspecies may be present (e.g. your local FWS field office, state surveys, your own surveys).

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 to 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 resident), you may query your location using the RAIL Tool and view 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 IPaC migratory bird species list has a breeding season associated with it (indicated by yellow vertical bars on the phenology graph in your “IPaC PROBABILITY OF PRESENCE SUMMARY” at the top of your results list), 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 Bald and Golden Eagle Protection 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 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 BCC species. For more information on avoidance and minimization measures you can implement to help avoid and minimize migratory bird impacts, please see the FAQ "Tell me more about avoidance and minimization measures I can implement to avoid or minimize impacts to migratory birds".

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.

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 look carefully at the survey effort (indicated by the black vertical line) and for the existence of the "no data" indicator (a red horizontal line). 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 does not represent all birds present in your project area. 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 and associated information help you know what to look for to confirm presence and helps guide implementation of avoidance and minimization measures to eliminate or reduce potential impacts from your project activities, should presence be confirmed. To learn more about avoidance and minimization measures, visit the FAQ "Tell me about avoidance and minimization measures I can implement to avoid or minimize impacts to migratory birds".

Interpreting the Probability of Presence Graphs
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 taller bar indicates a higher probability of species presence. The survey effort can be used to establish a level of confidence in the presence score.

How is the probability of presence score calculated? The calculation is done in three steps:
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.

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.

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.

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.

Coastal Barrier Resources System

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.

This location overlaps the following CBRS unit(s):

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.*

VA-39P - FI 11/16/1991
VA-39P - FI 11/25/2025

Data limitations

The CBRS boundaries used in IPaC are representations of the controlling boundaries, which are depicted on the official CBRS maps. The boundaries depicted in this layer are not to be considered authoritative for in/out determinations close to a CBRS boundary (i.e., within the "CBRS Buffer Zone" that appears as a hatched area on either side of the boundary). For projects that are very close to a CBRS boundary but do not clearly intersect a unit, you may contact the Service for an official determination by following the instructions here: https://www.fws.gov/service/coastal-barrier-resources-system-property-documentation

Data exclusions

CBRS units extend seaward out to either the 20- or 30-foot bathymetric contour (depending on the location of the unit). The true seaward extent of the units is not shown in the CBRS data, therefore projects in the offshore areas of units (e.g., dredging, breakwaters, offshore wind energy or oil and gas projects) may be subject to CBRA even if they do not intersect the CBRS data. For additional information, please contact CBRA@fws.gov.

Facilities

National Wildlife Refuge lands

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.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Wetland information is not available at this time

This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the NWI map to view wetlands at this location.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. 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 accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.