9-2021

Cedarbush Creek Dredge Channel Data Report

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Executive Summary

Cedarbush Creek is located in Gloucester County, Virginia. It is a long, but narrow creek that empties into the York River. The mouth is a wide embayment, but farther north, the creek narrows to about 400 feet wide and extends for about 1.5 miles to its marshy headwaters. Cedarbush Creek has never been dredged, but due to shoaling within the creek, it needs dredging to accommodate vessel traffic. Oliver's Landing, located near the mouth of Cedarbush Creek, is a working waterfront that supports commercial and recreational boaters in Gloucester.

The proposed channel is 80 ft wide and -6 ft MLLW deep with a 1 ft overdepth. An estimated 105,000 cy of material will need to be dredged from Cedarbush in order to create the proposed channel at an estimated cost of $1.5 million. Because of the high percentage of fines, the dredged material will likely be disposed of at a confined upland disposal area to limit any potential environmental impacts. The proposed disposal site is land owned by the Virginia Department of Conservation and Recreation (DCR) adjacent to Aberdeen Creek, which can be outfitted with Geotube® units to construct dikes in order to contain the sediment removed by dredging.

The sediment in the creek does not contain any contaminants outside of acceptable parameters but does contain a large percentage of fines. The ecosystem health of the York River has improved in recent years but is still considered to be in poor condition. The area is home to a wide variety of fish species whose populations have declined in recent years and whose young use the high productivity and submerged aquatic vegetation (SAV) of the York River as a nursery. However, Cedarbush Creek contains no SAV, and it is unlikely that dredging activity will disrupt any potential nursery areas. The benthic community of the area is considered to be in good health, and dredging may cause temporary disruption and damage to it; though, Cedarbush Creek shellfish harvesting has been restricted due to poor water quality. Dredging is unlikely to have significant impacts on local fish populations due to the lack of SAV, but may cause temporary disruption of the benthic community; however, it is unlikely to have significant impacts on shellfish harvesting in the area, as it is currently restricted.

Two other proposed channel designs were modeled. If the county wants a cheaper option, a -5 ft MLLW with 1 ft over-dredge, requiring 75,000 cy of material to be dredged, is proposed at an estimated cost of $1.3 million. However, should the county want a larger channel, a -7 ft MLLW with 1 ft over-dredge, requiring 138,500 cy of material to be dredged, is proposed at an estimate cost of $1.7 million. Another option is to only dredge from the York River into Cedarbush Creek just to Oliver's Landing, the working waterfront near the mouth. About 52,000 cy of material will have to be dredged and disposed of for this option.

Costs for the various scenarios are shown below. These costs are for hydraulic dredging and pumping to Middle Peninsula State Park where a 20-acre confined upland disposal site can be created with Geotubes to create a berm to contain the sediment at an estimated cost of $945,000. This large site can hold the dredge material for Aberdeen, Timberneck, and Cedarbush Creeks. Dredging all three channels at the same time will have cost savings. Also, a potential

alternative disposal site occurs at Catlett Island which may be used as a thin layer placement demonstration project.

Cedarbush has never been dredged previously, so it is difficult to estimate the useful life of this proposed project, as it is unknown how much and how quickly the channel will fill. Sedimentation rates were calculated inside the creek using sediments samples taken from core 4 and analyzed for ^{210}Pb and ^{137}Cs. The result indicates a rate of 1 cm/yr accretion. Though sedimentation may initially increase after dredging, the natural rate of deposition inside the creek indicates a rough useful life estimate is at least 10 to 20 years.

Dredge Depth +Overdepth	Volume Fines	Mob/Demob	Dredging	Total Cost
(ft MLLW)	(cy)	($)	($)	($)
Full Channel Dredging				
-6	75,000	$700,000	$600,000	$1,300,000
-7	105,000	$700,000	$787,000	$1,487,500
-8	138,500	$700,000	$969,500	$1,669,500
Dredging from York River to Oliver's Landing				
-7	52,000	$700,000	$442,000	$1,142,000

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Introduction

Cedarbush Creek is located in Gloucester County, Virginia (Figure 1). It is a long, but narrow creek that empties into the York River. The mouth is a wide embayment, but farther north, the creek narrows to about 400 feet (ft) wide and extends for about 1.5 miles to its marshy headwaters. The interior of the creek is irregular with one very small lateral creek/marsh drainage emptying into Cedarbush. Cedarbush Creek has never been dredged and a federally-authorized channel does not exist at the site. As a new dredging project, the channel design must balance safety, economic, and sustainability requirements. The channel also must be wide and deep enough to safely accommodate vessel traffic but not so large as to require excessive dredging or habitat modification (Figure 2). Cedarbush Creek has experienced shoaling to the point that the US Coast Guard aids to navigation (ATON) were slated for removal following a study in April/May 2017. Without dredging, the ATONs will be removed creating an adverse impact and safety concern for commercial watermen and recreational boaters seeking to navigate the channel. In the past, Oliver's Landing, located near the mouth of Cedarbush Creek, was a working waterfront that supported commercial and recreational boaters in Gloucester.

The Catlett Islands occur at the mouth and south of Cedarbush Creek and display a ridge-and-swale geomorphology. The Islands consist of multiple parallel ridges of forested wetland hammocks, forested upland hammocks, emergent wetlands and tidal creeks surrounded by shallow subtidal areas that once supported beds of submerged aquatic vegetation (Catlett Islands, 2020). The Chesapeake Bay National Estuarine Research Reserve owns most of the islands (460 acres), except for 79 acres on the northern tip which is privately owned and adjacent to Cedarbush Creek (Figure 2). Creek morphology is similar today as it was in 1937 (Figure 3), with Catlett Islands abutting the upland. The Islands have had a low to medium (between -1 and -5 ft per year) erosion rate between 1937 and 2017 (Figure 4) (Hardaway et al., 2020). The interior shorelines of Cedarbush have very low erosion rates.

The new Machicomoco State Park, owned and operated by the Virginia Department of Conservation and Recreation (DCR) occurs adjacent to the east shore of Cedarbush Creek. It covers 644 acres between Timberneck and Cedarbush Creeks. Land use along the eastern side of the creek is characterized by fallow agriculture with narrow tree buffers along the shoreline and some residential development, but the western side of the creek is generally more developed with waterfront homes and piers. Creating a defined channel that provides safe access for both recreational and commercial users is needed. The data collected for this project was used to develop the dredging and disposal strategies for the channel.

Channel Condition Assessment

Channel Condition Survey and Base Mapping

The channel condition surveys were performed by licensed surveyors at Waterway Surveys & Engineering, Ltd to determine the depth to the bottom in the projected channel both inside and outside the creek, on either side of the channel, inside the creek in the area of the

turning basin, and far enough seaward to reach the channel design depth in the natural system. Soundings were taken using a single beam sonar system operating at 208 kilohertz, and a differential global positioning system (DGPS) was used to obtain horizontal positions.

Coordinates were taken in US survey feet and referred to the Virginia State Plane coordinate system south zone based on NAD83 (Figure 5). Soundings were taken on October 14, 19, and 20, 2020 about 10 ft apart in lines spaced approximately 100 ft apart and referred to feet mean lower low water (MLLW). MLLW, National Tidal Epoch of 1983-2001, was determined by the National Ocean Service (NOS) at Cedarbush Creek. Mean tide range is 2.6 ft based on NOS observations.

Survey points were imported to Esri ArcMap, and a vector-based triangular irregular networks (TIN) surface was created. A TIN is a representation of a continuous surface consisting entirely of triangular facets. The vertices of these triangles are created from field recorded spot elevations from the bathymetric survey. From the TIN, a digital elevation model (DEM) was created. The DEM is a 3D computer graphics model of elevation data to represent terrain. In this case, the raster DEM grid size was 5 ft and uses colors to represent the bathymetry in feet relative to MLLW (Figure 6). The DEM can be used to calculate the amount of material that will be removed during dredging by assigning the channel grids to the desired dredge depth and determining the difference between the existing bathymetry and channel DEMs.

Sediment Sampling

Physical Sampling

A geotechnical analysis provides a sediment profile through direct sampling and testing studies of the in-situ benthic material. Eight vibracores were taken by VIMS in the channel on October 5, 2020 (Figure 7). The cores were photographed (Appendix A), logged (Appendix B), and sampled by VIMS to provide the types, configuration, and geotechnical character of the benthic subbottom soils present.

Samples for grain size testing was channel-sampled along a visually-identified lithologic section within the core. Grain size analysis included percent gravel, sand, silt, and clay (Appendix C) as well as a detailed representation of the sand portion using the Rapid Sediment Analyzer (RSA) settling tube. Overall sample statistics, including the median grain size (D50), were calculated using the percent data and the sand results. Percent moisture also was determined.

Sedimentation Rate Sampling

Sediments contain a background level of ^{210}Pb that is continuously deposited over time as it becomes fixed on sediment particles. With a half-life time of 22.3 years, ^{210}Pb is the sole natural radioactive lead isotope, the presence of which in the environment is directly related to the presence of the parent isotope. ^{210}Pb that was incorporated into the sediments 22.3 years ago will be only one half as radioactive as when initially deposited. This property of radioactive

decay can be used to calculate the approximate age of sediments at other depths in the sediment column and/or the rate of sediment accumulation over about the last 100 years.

Sedimentation rates were obtained by analyzing core samples for ^{210}Pb and ^{137}Cs radioisotopes using gamma spectroscopy. Dried and homogenized samples were packed in Petri dishes and sealed with electrical tape and paraffin wax 30 days prior to analysis to allow for equilibration between 226Ra and its daughter isotopes, 214Pb and 214Bi (supported ^{210}Pb). Total ^{210}Pb (46.5 keV photopeak) and ^{137}Cs (662 keV photopeak) activity was measured for all samples along each core using a Canberra GL 2020 Low Energy Germanium detector (Virginia Institute of Marine Science Geochronology Lab). Total ^{210}Pb counts were corrected for detector efficiency and self-attenuation using the point-source method (Cutshall et al., 1983). Concentrations of excess ^{210}Pb used to obtain age models were determined as the difference between total ^{210}Pb and supported ^{210}Pb (Table 1). ^{137}Cs is a bomb-produced radionuclide used to verify accumulation rates determined by ^{210}Pb geochronology. ^{137}Cs is a by-product of nuclear weapons testing. It first occurred in the atmosphere in about 1952 and peaked during 1963-64. It adsorbs strongly to fine-grained sediments and therefore can be used to determine the time of deposition of sediments that have been exposed to atmospheric fallout. Peak ^{137}Cs activity is assumed to be 1963.

The constant flux-constant sedimentation (CFCS) model (Corbett & Walsh, 2015) was used to calculate sedimentation rates over the last ~100 years at all sites, assuming a constant rate of accumulation and flux of excess ^{210}Pb. These rates were calculated using the following formulas:

$$Az = A0\ e^{-\lambda t}$$

$$t = z / S$$

where Az is the excess (unsupported) ^{210}Pb activity for a sample at depth z, A0 is the excess ^{210}Pb activity at the time of sample collection, λ is the ^{210}Pb decay constant, and t is elapsed time since burial. To calculate a vertical accretion rate (S), the natural log of excess ^{210}Pb activities were plotted against depth to obtain a slope of the best-fit line (m):

$$S = \lambda / m$$

Using Cedarbush's core 4, 4-centimeter (cm) samples were taken from the top of the core at 12 cm intervals until a depth of 140 cm was reached. Each sample farther along the core was still 4 cm along the length of the core, but it occurred at 28 cm intervals (Table 1). Using this method, the natural sediment accretion rate in Cedarbush Creek within the last 60 years averaged about 1 cm/yr. ^{137}Cs radioisotopes also were used to determine the approximate age of the sediments at a particular depth by assuming the peak of ^{137}Cs is the year 1963. As the ^{137}Cs peak is located at a mid-range depth (approximately 40 to 44 cm), it supports the findings of a moderate (1 cm/yr) accretion rate.

Table 1. Summary table of ^{210}Pb and 137Cs sedimentation analysis of Cedarbush Creek core 4.

Sample ID	Depth Range (cm)	Mean Depth (cm)	Depth Range ± (cm)	Excess ^{210}Pb DPM/g	^{210}Pb Error (±DPM/g)	Ln(Excess)	Total ^{137}Cs (DPM/g)	^{137}Cs Error (±DPM/g)
CB-04_8-12cm	8 - 12 cm	10	2	2.509	0.1966	0.92	0.1491	0.01079
CB-04_24-28cm	24- 28 cm	26	2	2.004	0.1815	0.70	0.2723	0.01562
CB-04_40-44cm	40 - 44 cm	42	2	1.226	0.1186	0.20	0.3616	0.01811
CB-04_56-60cm	56 - 60 cm	58	2	0.380	0.1076	-0.97	0.0000	0.00000
CB-04_72-76cm	72 - 76 cm	74	2	0.569	0.0972	-0.56	0.0000	0.00000
CB-04_88-92cm	88 - 92 cm	90	2	0.444	0.0976	-0.81	0.0000	0.00000
CB-04_104-108cm	104 - 108 cm	106	2	0.763	0.1225	-0.27	0.0000	0.00000
CB-04_120-124cm	120 - 124 cm	122	2	0.238	0.0837	-1.44	0.0000	0.00000
CB-04_136-140cm	136 - 140 cm	138	2	0.272	0.1035	-1.30	0.0000	0.00000
CB-04_168-172cm	168 - 172 cm	170	2	0.598	0.1134	-0.51	0.0221	0.00404
CB-04_200-204cm	200 - 204 cm	202	2	0.422	0.0862	-0.86	0.0000	0.00000
CB-04_232-236cm	232 - 236 cm	234	2	0.355	0.1084	-1.04	0.0000	0.00000
CB-04_264-268cm	264 - 268 cm	266	2	0.439	0.1127	-0.82	0.0000	0.00000
CB-04_304-308cm	304 - 308 cm	306	2	0.603	0.1049	-0.51	0.0000	0.00000
CB-04_336-340cm	336 - 340 cm	338	2	0.257	0.0885	-1.36	0.0000	0.00000
CB-04_368-372cm	368 - 372 cm	370	2	0.723	0.1183	-0.32	0.0000	0.00000
CB-04_400-404cm	400 - 404 cm	402	2	0.443	0.1229	-0.81	0.0000	0.00000
CB-04_432-436cm	432 - 436 cm	434	2	0.824	0.1391	-0.19	0.0000	0.00000
CB-04_464-468cm	464 - 468 cm	466	2	0.375	0.1017	-0.98	0.0000	0.00000
CB-04_496-500cm	496 - 500 cm	498	2	0.616	0.1344	-0.48	0.0000	0.00000
CB-04_528-532cm	528 - 532 cm	530	2	0.560	0.1169	-0.58	0.0000	0.00000

Chemical Testing

The Evaluation of Dredged Material Proposed for Discharge in the Waters of the U.S. – Testing Manual was developed as a joint effort by the Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (EPA & USACE, 1998) and is referred to as the "Inland Testing Manual (ITM)." The purpose of the manual was to "establish procedures applicable to the evaluation of potential contaminant-related environmental impacts associated with the discharge of dredged materials in inland waters, near coastal waters and surrounding environs." The ITM was primarily developed to establish testing protocols associated with the disposal of dredged material discharges associated with navigation dredging.

The ITM utilizes a tiered approach to determine test requirements for dredged material disposal. There are four tiers: Tier I is an evaluation based on existing information; Tier II includes a chemical evaluation of identified contaminants of concern; Tier III is associated with general toxicity and bioaccumulation tests; and Tier IV provides for project specific toxicity and bioaccumulation tests.

The development of testing requirements always starts with a Tier I evaluation which is an analysis based on existing information. The evaluation can be based on previously collected

physical, chemical or biological data; physical sediment characteristics (i.e. is the material comprised of sand, gravel or inert materials); or if the dredged material is associated with known sources of contamination. If there is no available chemical data at the dredging site, but the material is a sandy or inert material or there are no known sources of contamination or contaminant pathways to the dredging site, then there is "no reason to believe" that the disposal of the dredged material would have an adverse impact at the disposal site. Once it has been determined that there is "no reason to believe," then the dredged material passes the Tier I and no additional evaluation is required. If, however, there is "reason to believe" that there is the potential for contaminants to exist at the dredging site, then a Tier II evaluation would be initiated. The "contaminants of concern" must be identified and a then a sampling plan should be designed to address the concentration of those specific contaminants in the site sediment and water. The results of the Tier II evaluation determine the need for evaluation at higher tiers. If the dredging site passes a Tier I evaluation, the only other time that chemical testing may be required is for disposal of dredged material into a regulated area such as a landfill.

Cedarbush passes the Tier I evaluation, but because this creek has a high percentage of fines, the material will likely go to a confined upland disposal area. Two samples were collected from Cedarbush Creek in the York River for chemical testing – one at an up-creek location and one at a down-creek location (Figure 7). A grab sampler was used for data collection. The grab sampler was thoroughly cleaned before samples were extracted by rinsing in water, with any excess debris scrubbed off with a brush. Once retrieved with sediment inside, the grab sampler was set on the side of the boat to allow any excess water to drain. The closed grab sampler was then positioned on the side of the boat with the mouth of the sampler hanging over the edge, to prevent the sediment from coming in contact with the surface of the boat and potentially contaminating the sample. Sediment was scooped into sterile glass containers of various sizes provided by *Enthalpy Analytical* using a stainless-steel spoon. Samples were then placed in coolers below 43ºF and taken to *Enthalpy Analytical* the following day.

The samples were then tested for a variety of different chemicals, toxins, and metals. Table 2 illustrates what each sample was analyzed for, as well as potential sources. The results are shown in Appendix D, but neither sample location had any of the contaminants in quantities larger than the limits of the tests used and therefore, no contamination-related issues are anticipated regarding placement or disposal of dredged material.

Table 2. A list of chemicals and metals tested in samples taken from Cedarbush Creek as well as their possible source

Analysis:	Source:
MTBEX*	fuel component for gasoline engines
TCLP Silver	Industrial use
TCLP Mercury	Industrial use
TCLP Arsenic	Industrial use
TCLP Lead	Industrial use
TCLP Barium	Industrial use
TCLP Selenium	Industrial use
TCLP Cadmium	Industrial use
TCLP Chromium	Industrial use
PCB**	Commercial electrical equipment
TCLP Predetermination SVOC***	Occurs naturally/Industrial use
TCLP Pest	Industrial use
TCLP Herb	Industrial use
Semi-Volatile Hydrocarbons as TPH Diesel Range Organics****	Compounds in diesel fuel
Organochlorine Pesticides and PCB's as Aroclor	Pesticides in agriculture
TCLP Organochlorine Herbicides	Pesticides in agriculture/plant removal
TCLP Organochlorine Pesticides and PCB's	Pesticides in agriculture

Note: TCLP stands for "Toxicity Characteristic Leaching Procedure"
*MTBEX refers to methyl tert-butyl ether (MtBE) which is the analysis of benzene, toluene, ethylbenzene, and xylenes (BTEX)
**PCB refers to polychlorinated biphenyls, a harmful and highly toxic industrial compound
***SVOC refers to Semi Volatile Organic Compounds
****TPH refers to Total Petroleum Hydrocarbons

Benthic and Fisheries Assessment

Cedarbush Creek is a small lateral tidal creek located in the mesohaline section of the York River. Major subtidal benthic habitats in the York River include soft mud and sand bottoms, with only limited distribution of submerged aquatic vegetation and oyster shells (Gillett & Schaffner, 2009). Major taxonomic groups of macrofauna dominating muds and sands include annelids, mollusks and crustaceans. Meiofaunal assemblages of the York's soft bottoms are dominated by nematodes and copepods. Species distribution patterns are strongly correlated with salinity and bottom type (Gillett & Schaffner, 2009). The benthic communities around the Bay have been assessed using the Index of Biological Integrity. This index ranks the relative value of bottom communities around 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, the York

River had poor ecosystem health (D+) in 2020. Many of the gains made in 2019 were reversed in 2020 as overall health dropped from 37% to 32% between 2019 and 2020. Scores dropped for dissolved oxygen, nitrogen, phosphorus, chlorophyll a, water clarity, and aquatic grasses. Benthic community was the only score that increased (EcoHealth, 2020).

Cores and augers taken for this project included the top benthic horizon. Through ongoing visual assessment, no macroscopic benthic species were noted. This might include various species of polychaetae worms and small clams. This does not mean the benthic community is void but just not sampled by the cores. Despite their relatively small size, macro and meiobenthos are important components of the estuarine ecosystem, serving as critical links between the variety of organic matter sources in estuaries (e.g., phytoplankton, benthic micro- and macroalgae, detritus) and the economically, ecological, and recreationally important finfish and crustaceans that live there (Cicchetti, 1998). Baird & Ulanowicz (1989) estimated that approximately 50% of the fish production in Chesapeake Bay is directly linked to a benthic food web.

The York River system is home to a diversity of fish species, some are year-round residents and others use the river during a particular season or life stage (Hewitt et al., 2009). More than 130 species of fish have been observed in the York. These species include top predators such as sharks, as well as plankton feeders such as bay anchovies. The diversity represented by fish fauna includes members of the shad and herring family, drums, flatfishes, temperate basses, catfishes, sharks, skates, rays, and numerous smaller fishes that serve as forage such as bay anchovy, Atlantic menhaden, and killifish. Historically, fisheries for blue crabs, American shad, striped bass, and Atlantic sturgeon thrived in the Chesapeake Bay region but in recent times, and with the exception of striped bass, these fisheries have declined (Hewitt et al., 2009).

Fishes in the York have varying life history patterns, from fast growing species such as alewife, to slow growing, late maturing species such as Atlantic sturgeon. The young of many species use the York River system as a nursery area and depend on the high productivity of this estuary for conferring fast growth and high survival during the first year of life. However, areas of SAV are needed for settlement and protection, but Cedarbush Creek had no submerged aquatic vegetation (SAV) within the proposed channel (SAV, 2020) between 2015 and 2019. Blue crabs are important fisheries in the York and are especially abundant in its shallow areas. Crabs enter a state of low to no activity in the winter, and they often bury in muddy sediments in deeper water during this period (Hewitt et al., 2009). Habitat alterations that result in a loss of water quality or quantity may decrease recruitment of young fishes through direct effects on young-of-the-year fish survival, or through disruption of spawning activity (e.g., dam construction, and water withdrawals that affect salinity and flow). Though dredging Cedarbush Creek will impact the benthic environment, it may also allow an improvement in Creek water quality with less constricted flows from creek to river. Cedarbush Creek has restricted harvesting for shellfish due to water quality (Figure 8).

Dredging impacts to fisheries is a concern that has been evaluated and researched by the Corps 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 oysters, 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 subjected to frequent natural disturbances. Rates of recovery vary from 6-8 months in estuarine muds, possibly 2-3 in sand and gravel habitats.

Sometimes permitting agencies will invoke a time of year (TOY) restriction on dredging when these species are migrating and/or overwintering. In addition, maximizing the dredge depth during the project 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 effects on the environment should be minimal and be offset by the project benefits of maintaining safe navigation and commerce.

Local private oyster leases in the creek are mapped at the mouth of the creek, and two leases cross parts of the proposed channel (Figure 9). Inside the creek, a small lease exists, but it will not be affected by the proposed channel. Applications have been submitted to the Virginia Marine Resources Commission (VMRC) for two proposed new lease areas on the west side of the creek. These are under consideration but have not been approved to date. The northernmost application would not be affected by the proposed dredging activities. However, one of the applications occurs just north of the working waterfront, Oliver Landing, and its footprint would fall within the proposed turning basin for Oliver's Landing, if approved by VMRC. If that occurs, the turning basin could be removed from the channel design to minimize impacts to the lease.

Channel Design and Disposal Strategy

Channel Design

When designing the channel at Cedarbush, the federally-defined 80 ft wide, 6 ft deep Aberdeen Creek channel was used as guidance. Aberdeen Creek experiences similar levels of use and types of users and also has a turning basin adjacent to a public working waterfront. The proposed Cedarbush channel is 80 ft wide, starts at the -8 ft MLLW depth contour on the York River end of the channel, extends 9,000 ft into the creek. The proposed channel includes an offshoot that extends to the pier at Oliver's Landing and a small turning basin that is 55 ft wide and 120 ft long. The north trending spur channel about half way up has deeper water access for the Oliver's Landing at the end of Cedarbush Road, Route 633.

A channel needs to be at least 6 ft deep so that a buoy-tender can access the site to set and/or maintain aids to navigation (ATONs). At Cedarbush Creek, to create a -6 ft MLLW

channel and 1 ft of over-dredge, approximately **105,000 cubic yards (cy)** of material will need to be hydraulically dredged and disposed of (Figure 10). Where the material needs to be dredged from in the channel varies. The calculated DEM depicts is shown in various colors to depict the amount of dredging needed. Sections of the channel that require more dredging are shown in red. Sections of the channel where less material needs to be removed are shown in green. Areas deeper than -7 ft MLLW do not have to be dredged in that section of channel and are shown in white. If dredged to -7 ft, material will have to be removed from the entire channel including the spur channel. Cedarbush's natural channel is about 4-5 ft deep up to its mouth. Inside the creek, it is shallower and requires more dredging. North of Oliver's Landing is where the most dredging is needed, particularly at the farthest inland reach of the proposed channel.

Typical channel cross-sections depict the change from existing bottom that will occur due to dredging (Figure 11). Each cross-section looks up-creek. Cross-sections, B, D, and E show that the proposed channel follows the existing natural channel fairly well even though the natural channel is not very well defined in areas. Profiles A and C show that those regions are shoaled.

Sediment analysis of cores taken in the channel show that much of the material is too fine to be utilized for shoreline beneficial use (Figure 12). All of the material dredged is silt and clay with the exception of Core CB-02 (Figure 7). CB-02 has sand in its top layers, but the topmost section that will be dredged has 24% fines in it. This means it has too much silt and clay mixed in with the sand to be of beneficial use along the shore. To reduce the amount of fine material that will have to be dredged and disposed of, the channel can be shortened. If the proposed channel is only dredged up to the offshoot that extends to Oliver's Landing, the amount of fine dredge material would be cut in half. North of the offshoot that extends to Oliver's Landing, the calculated amount of material to be dredged is **53,000 cy**. South of there and into the York River, about **52,000 cy** of material will need to be dredged.

Two other scenarios were modeled for the proposed Cedarbush channel. Should the county seek to pursue a less expensive option, a -5 ft MLLW channel with a 1 ft over depth would require only about **75,000 cy** of material to be removed. This option reduces both the dredging cost per volume and reduces the footprint needed for a disposal area. If the proposed channel is dredged to -7 ft MLLW with a 1 ft over-dredge (total 8 ft dredge cut), the amount of material that will have to be removed is **138,500 cy**, all of it silt and clay. This option requires a much larger confined upland disposal site for the silt and clay material that would be dredged.

Table 3. Summary of proposed channel dredging depths at Cedarbush Creek. Note: a -6 ft MLLW depth is needed for ATON maintenance so the * scenario is the preferred option.

Channel Depth	Overdepth	Total	Volume Fines
(ft MLLW)	(ft)	(ft MLLW)	(cy)
Dredging entire proposed channel			
-5	-1	-6	75,000
-6*	-1	-7	105,000
-7	-1	-8	138,500
Dredging from York River only to Oliver's Landing			
-6	-1	-7	52,000

Disposal Strategy

Because most of the material to be dredged is fine sediment, it cannot be placed along the shoreline, but rather requires a confined upland disposal site. Containment dikes are used to retain water borne sediments, hydraulic fills and other fills. To reclaim land from the sea, or to provide a storage facility for soil or other soil materials, it is common practice to first construct a containment dike around the extremity of the area to be filled. The function of the containment dike is to prevent loss of the fill into the surrounding environment. To avoid digging into the ground to construct a conventional upland disposal area, Geotube® units may be utilized to construct the dike using locally available sand as the dike fill (Figure 13). Geotube® is a registered trademark of TenCate Geosynthetics. The tubes come in various sizes, weights, and filtering ability, and can be placed into a wide variety of configurations. Typically, they are filled with dredge material to create the dike on the outside of the disposal area and additional material can be placed inside the dike.

The Virginia Department of Conservation and Recreation (DCR), Division of State Parks owns property adjacent to Aberdeen Creek (Figure 14). The property was originally purchased to be used as the Middle Peninsula State Park. However, land adjacent to Timberneck and Cedarbush Creeks has since been acquired and developed into Machicomico State Park. DCR has stated that dredge material cannot be placed on Machicomico. However, as the DCR property adjacent to Aberdeen is not developed, they may allow a portion of the property adjacent to Aberdeen to be used as an upland disposal area. Cedarbush Creek is about 2.5 miles downriver of Aberdeen Creek. If dredging any of these two channels happened at the same time, savings would occur in mobilization and demobilization costs. Gloucester County also has completed a dredging design for Timberneck Creek, and hydraulically-dredged material could be pumped upriver from Cedarbush and Timberneck to the Aberdeen placement site for even further cost savings in mobilization and demobilization.

For the DCR property confined disposal site, Geotubes® that are 5 ft tall with a 25 ft circumference and a 10 ft filled width can be stacked along the perimeter of the site to create the dike (Figure 15). Each tube is filled with about 3.8 cy/ft which amounts to 11 cy/ft for all three tubes. The proposed placement area, is shown in Figure 14, could accommodate dredge material

from Aberdeen, Timberneck, and Cedarbush. Based on preferred dredging scenarios modeled for this project, the maximum amount of material that would be dredged from all three channels totals about 210,000 (59,000 cy Aberdeen, 46,000 cy Timberneck, 105,000 cy Cedarbush). The previously-designed placement area has a perimeter of 4,000 ft and covers about 18 acres. To accommodate the additional volume of material, the placement area design could be enlarged slightly to 20 acres. The 3-bag configuration of Geotubes® would hold about 44,000 cy of material. The volume that could be held inside the dike is about 176,000 cy for a total volume of 220,000 cy.

Total Dredge Volume, -5 ft MLLW with 1 ft over depth: 75,000 cy
Volume Placed in Geotubes®: 44,000 cy
Volume Placed within Geotube confinement area: 31,000 cy

Total Dredge Volume, -6 ft MLLW with 1 ft over depth: 105,000 cy
Volume Placed in Geotubes: 44,000 cy
Volume Placed within Geotube confinement area: 61,000 cy

Total Dredge Volume, -7 ft MLLW with 1 ft over depth: 138,500 cy
Volume Placed in Geotubes®: 44,000 cy
Volume Placed within Geotube® confinement area: 94,500 cy

Because these channel dredging projects are a priority for Gloucester County, creating one larger placement area is the preferred option. It provides longer-term dredge disposal options for these three creeks that occur on the mid-York River. The previously-designed Geotube dike configuration (shown in the Aberdeen Creek and Timberneck Creek reports) could not hold all of the material from all three creeks for the preferred dredge scenarios. Using larger bags or covering a larger area would allow for all three dredge projects to utilize the disposal site. Another option is to reduce the length of the channel dredging at Cedarbush Creek. Dredging only to Oliver's Landing would reduce the amount of dredging needed to **52,000 cy**. While other alternative sites for upland disposal area construction may exist near Cedarbush, they have not been identified to date.

The -6 ft MLLW with 1 ft over depth (total dredge depth -7 ft MLLW) is the preferred dredging option because the depth allows for ATON maintenance and would be similar to the Aberdeen Creek federal channel and the proposed Timberneck Creek channel. This scenario is laid out in the Joint Permit Application (Appendix E).

Because the upland disposal site is located on DCR property, Gloucester County will have to work with the state to determine maintenance issues at the site. Maintenance could include installing access pathways and mowing of vegetation on the site. Once the material inside the confinement area dries, it can be dug up and removed to a landfill, or reused as upland fill or foundations for trails and paths, or offered for commercial or industrial reuse elsewhere. In addition, the Geotubes® themselves can be chopped up and removed to the landfill, if desired.

This YouTube video shows how Geotubes® can be used as dikes to contain sediment. https://www.youtube.com/watch?v=m0F2XhSYYV4.

Thin Layer Placement

Another potential use for the material from Cedarbush has been proposed. Thin layer placement (TLP), or thin-layer sediment addition, is a process in which sediment removed from navigation channels during dredging is transported to a marsh restoration site, where it is applied to the surface of the marsh by spraying a slurry of water, sand, and silt (VIMS, 2014). The main goal of TLP is to restore and maintain coastal wetlands by emulating the natural processes of gradual sediment deposition, slightly increasing their elevation to allow the marshes to continue to exist and thrive in the face of erosion and sea-level rise without limiting vegetation growth (Raposa et al., 2020). The amount of sediment deposited through thin-layering depends on its usage. The restoration and maintenance of an existing wetland requires approximately six inches of sediment deposition, while the creation of a new wetland requires at least a foot of sediment deposition (Welp et al., 2014). Adding too little sediment may not allow the marsh to withstand erosion and flooding, which can damage vegetation. However, adding too much sediment may limit natural plant growth and leave the marsh vulnerable to invasive species like *Phragmites australis.* Due to the Chesapeake Bay's conditions of rising water levels and land subsidence, in conjunction with its many channels and inlets in need of dredging, thin-layering techniques may prove to be extremely beneficial in creating, restoring, and maintaining coastal wetlands in the region (VIMS, 2014).

In Virginia, all privately owned property adjacent to bays, rivers, creeks, and shorelines extends to the mean low water (MLW) mark (Va. Code Ann. § 28.2-1202, 1919). This means that the majority of coastal wetlands in Virginia are privately owned, and, therefore, property owners must be contacted and give permission for dredged materials to be placed on the marsh surface. Additionally, subaqueous material to be dredged from public land and placed on marsh surfaces must first be reviewed by government and academic entities; the only exception being the dredging of material for maintenance of federally-defined channels (VIMS, 2014).

The total cost of TLP can vary widely, from less than $5,000/acre to upwards of $100,000/acre, depending on a variety of factors such as transportation methods and distance, as well as how the sediment is distributed. Typically, hydraulically spreading the sediment is cheaper than using mechanical methods (French, 2018). For example, the US Army Corps of Engineers has proposed a thin-layering marsh restoration project at Cedar Island near the Delmarva Peninsula using hydraulic sediment deposition, which they estimate will cost a total of $108,000 (USACE, 2016). However, in many cases, the restoration or creation of coastal wetlands can make the initial cost of thin-layering well worth the effort. Coastal wetlands provide a wide range of benefits, including protecting coastal areas from storm surges, providing the food chain base for commercial and recreational fisheries, improving local water quality through nutrient absorption, and sequestering large amount of atmospheric carbon. Together, all of these benefits are estimated to be worth approximately $25,000/acre/year (VIMS, 2014).

Thin-layering may prove to be a beneficial strategy for dredging and disposal activities at Cedarbush Creek, as the dredged material is planned to be stored within a Geotube® upland disposal area. Because of this, thin-layering may help to create a coastal wetland that is resistant to sea-level rise and erosion while also providing many of the aforementioned benefits to the surrounding area. As the dredged material will be placed at the upland disposal site regardless, thin-layering activities should not significantly increase project costs, and may in fact provide monetary offsets to the project through future benefits of the creation of a new, healthy coastal wetland.

In discussions with Chesapeake Bay National Estuarine Research Reserve (CBNERR) personnel, the reserve managers are interested in a TLP demonstration site on Catlett. In addition to eroding from wave action along its margins (Figure 16), Catlett also is losing marsh as it is converted to non-vegetated wetlands and open water due to sea level rise. The habitats mapped by Hardaway et al. (2012) show that ghost tree area is inland of the tree line indicating that the trees are dying off (Figure 17). Since this map was created in 2007, areas of high marsh have converted to intertidal/low marsh habitat.

CBNERR is interested in a layering demonstration project (Figure 18). At the identified area, the marsh grasses have nearly completely disappeared. The 5.5-acre site would be surrounded by low Geotubes® about 2 ft high. These would be filled with dredge material. Approximately 6-8 inches of dredge material would be placed inside the perimeter made by the Geotubes®. The idea is to raise the sediment to allow natural marsh vegetation to take hold. This site design could hold about 17,500 cy of material. To accommodate additional material, a larger area could be used or a second TLP project on a different part of the islands could be created. Though this is a beneficial use and the CBNERR managers would like to have a demonstration site, certain issues make this a challenging project. NOAA is the agency in charge of the Research Reserves, and CBNERR needs to obtain permission before embarking on a demonstration project. Permitting is another issue because the project would involve covering 5.5 acres of vegetated and non-vegetated wetlands. The demonstration project also would add to the overall cost of the dredging. The Geotubes® and sediment layering will only take a small portion of the dredge material from Cedarbush Creek. Adding it as a second disposal site would increase the time and effort during dredging, growing the overall cost. If these issues can be resolved, this is a great opportunity for a demonstration project that provides a beneficial use of dredge material to reduce the Bay's loss of marsh.

DCR Statement of Approved Land Use for Dredge Material Disposal

DCR recognizes the public need for dredging in Gloucester County, especially Aberdeen Creek, Cedarbush Creek, and Timberneck Creek which are adjacent to DCR owned State Parks. Over a multi-month period covering late Summer and Fall of 2020, DCR staff including Tom Smith, DCR Deputy Director of Operations; Melissa Baker, Virginia State Parks Director; Ann Zahn Tidewater District Manager for the Virginia State Parks; and Middle Peninsula Planning District Commission staff met and discussed the history of the Virginia Waterways Management Fund, public need for dredging and the specific assistance needed from DCR with dredge

material storage. Consensus was reached on several predicate questions that will drive how, where, and under what conditions dredge material placement and storage is agreeable for DCR and Virginia State Parks. The development of the 2021 Middle Peninsula Park Master Plan will be a critical planning document that shall speak to the appropriateness of dredge material storage sites.

As of this report date, DCR staff request that Machicomoco State Park, adjacent to Cedarbush Creek be fully left off the table as a potential dredge material storage site. However, if the following conditions can be met to the satisfaction of DCR and Virginia State Parks, the Middle Peninsula State Park site adjacent to Aberdeen Creek has limited areas that could be utilized for dredge material storage:

- Dredge material to be stored at the Middle Peninsula State Park is a significant issue for DCR and must be contaminant free.
    - A chemical/contaminant report on dredge material composition shall be provided to DCR for review prior to any decision on possible material storage location(s).
- Some locations at the Middle Peninsula State Park have significant natural and/or cultural heritage resources.
    - Areas with significant natural and/or cultural heritage resources are not acceptable for material storage at this time (Figure 19).
    - In areas where appropriate and to minimize land disturbance, storage areas can be designed and incorporate products like Geotextile tubes to preserve unknown cultural resources.
- Some locations at the Middle Peninsula State Park will be designated recreational usage areas. An analysis of potential conflicts between recreational use and dredge material storage is needed.
- Based on preliminary information, DCR currently prefers the use of hydraulic piping as the preferred method over trucking, but the final storage location(s) will drive the preferred method of conveyance.
- If the dredge material is of appropriate composition, DCR could benefit from having material for use as trail (foundation) building material.
- DCR understands VIMS and other research institutions are looking at thin layer sediment placement to tidal marshes to enhance coastal resilience. Should this prove effective, meet regulatory requirements and the resources be available, it is one option for possible consideration by DCR
- DCR may have future dredging needs at Cedarbush Creek, but at this time cannot speak to the need and/or the willingness to partner with an applicant to include DCR dredging needs as part of a dredging project.

Though the upland disposal area at the Middle Peninsula State Park is likely the primary disposal option, other alternatives could involve piping to nearby locations for upland disposal as needed. The US Army Corps of Engineers historically used a disposal site along the York River near the mouth of Aberdeen Creek and though this location could be considered for placement of material again, the presence of emergent wetlands there would likely involve additional wetland

mitigation credits to be purchased. Additional nearby properties could be explored as placement options should the property owner be open to accepting the material and a viable and permissible placement alternative could be attained. The material could also be transported via truck to less proximal locations or even to existing landfills or dredge material disposal areas if necessary. However, for large volumes of material, this can become cost-prohibitive.

Costs

Estimated costs were provided by Waterway Surveys & Engineering and TenCate Geosynthetics Americas. The project cost has $700,000 included for mobilization/demobilization so there would be significant savings if the other shallow water draft channels on the York River, Aberdeen and Timberneck Creeks, were combined with the Cedarbush dredging project (Table 4). Because equipment and pipe must be moved from channel to channel, combining projects will not result in a full price savings of mobilization/demobilization. Dredging a channel to a shallower depth does not necessarily produce a large cost-savings because most of the cost is in mobilization and demobilization. In addition, dredging deeper will increase the useful life of the project, but this has to be balanced with the increase in dredge spoil that would have to be disposed of.

Table 4. Estimated cost for select dredging scenarios at Cedarbush Creek.

Dredge Depth +Overdepth	Volume Fines	Mob/Demob	Dredging	Total Cost
(ft MLLW)	(cy)	($)	($)	($)
Full Channel Dredging				
-6	75,000	$700,000	$600,000	$1,300,000
-7	105,000	$700,000	$787,000	$1,487,500
-8	138,500	$700,000	$969,500	$1,669,500
Dredging from York River to Oliver's Landing				
-7	52,000	$700,000	$442,000	$1,142,000

Dredging Mobilization includes all costs for operations accomplished prior to 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; and
- All costs for any other associated work that is necessary in advance of the actual dredging operations.

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

Because no location has been identified immediately adjacent to Cedarbush Creek for a confined upland disposal area, the material will be pumped upriver to a site on DCR property

adjacent to Aberdeen Creek. Disposal costs have been determined for a Geotube® disposal area. Combining disposal options for Aberdeen, Timberneck, and Cedarbush and constructing one large placement area could provide a long-term plan to handle future maintenance dredging events. A larger area will allow the dredged material to dry between dredging events, and the dried material can be reused for a beneficial use or hauled to the landfill.

The cost for the preferred disposal area (20 acres) created with Geotubes® is $945,000. The tubes will be used to create a 2:1 Geotube® (2 on the bottom, 1 on top) pyramid perimeter dike. Combining the length of all three tubes results in 13,500 linear feet of tubing. The free capacity inside the dike is expected to contain at least 176,000 cy of dredge material. This provides the space for dredge material from Aberdeen, Timberneck and Cedarbush. A spillbox and piping also would be need to control effluent water quality. Logging and other site preparations are not included in the estimate. The area needed for this disposal area is about 20 acres.

Useful Life Estimate

Estimating the useful life of the dredge project is difficult for Cedarbush. No data exists because the channel has not previously been dredged. During dredging, the cut of the bottom material should be sufficient to allow slope material to slough off (or cave) to the natural underwater shape of the bottom without encroaching the desired channel dimensions. However, some slumping of the dredge channel side slopes may occur over time causing infilling of the channel. Overall, shoaling within the channel is not linear; it starts fairly quickly after dredging but slows over time as the channel reaches equilibrium. Little sand occurs in the channel which indicates that the inside channel will likely fill in with fines brought in by tidal flow and the contribution from upland sources.

To help determine the useful life of the channel, sedimentation rates were determined using ^{210}Pb radioisotopes found within core 4 sediment samples (Figure 7). Using this method, the natural sediment accretion rate in Cedarbush Creek within the last 60 years averaged about 1 cm/yr (Figure 18). ^{137}Cs radioisotopes also were used to determine the approximate age of the sediments at a particular depth by assuming the peak of ^{137}Cs is the year 1963. As the ^{137}Cs peak is located at a mid-range depth (approximately 40 to 44 cm), it supports the findings of a moderate (1 cm/yr) accretion rate. Though sedimentation may initially increase after dredging, the natural rate of deposition inside the creek indicates a rough estimate of useful life of this project is at least 10-20 years.

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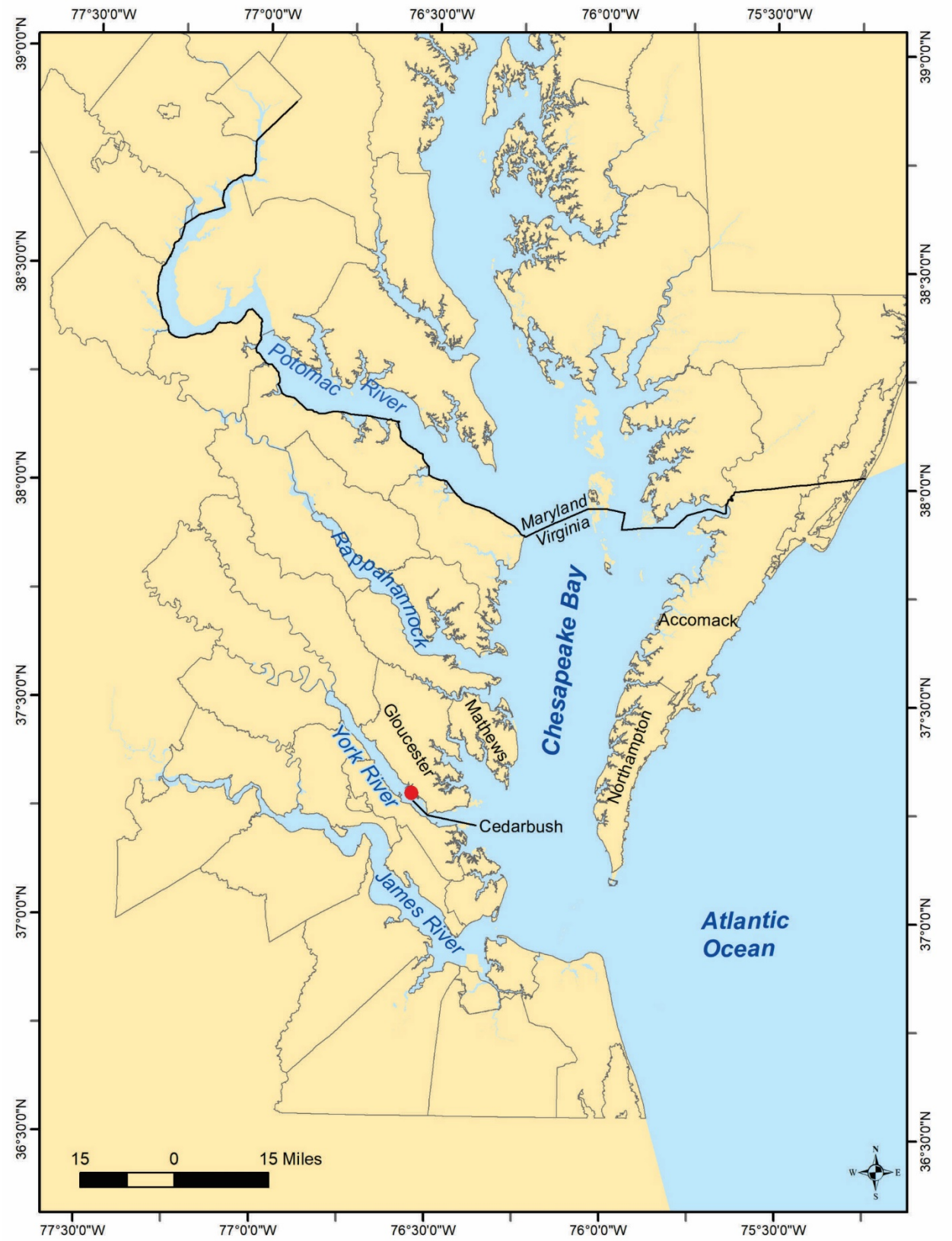


Figure 1. Location of Cedarbush Creek within the Chesapeake Bay estuarine system.

Figure 2. An orthorectified VGIN image showing Cedarbush Creek in 2017. Also shown are the proposed dredge channel and the boundaries for Catlett Island and Machicomico State Park.

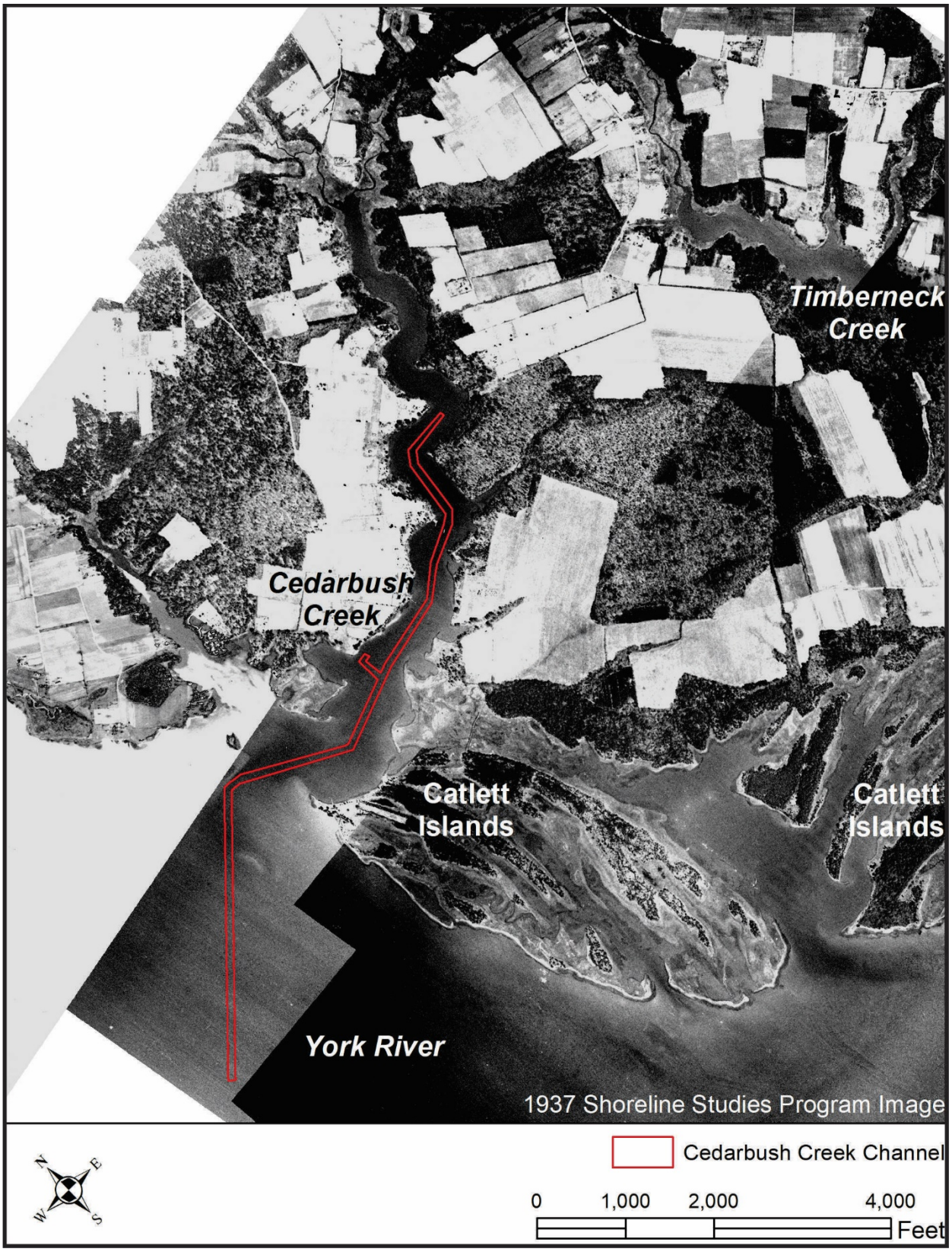


Figure 3. An orthorectified image showing Cedarbush Creek in 1937. From Shoreline Studies Program Shoreline Change Database.

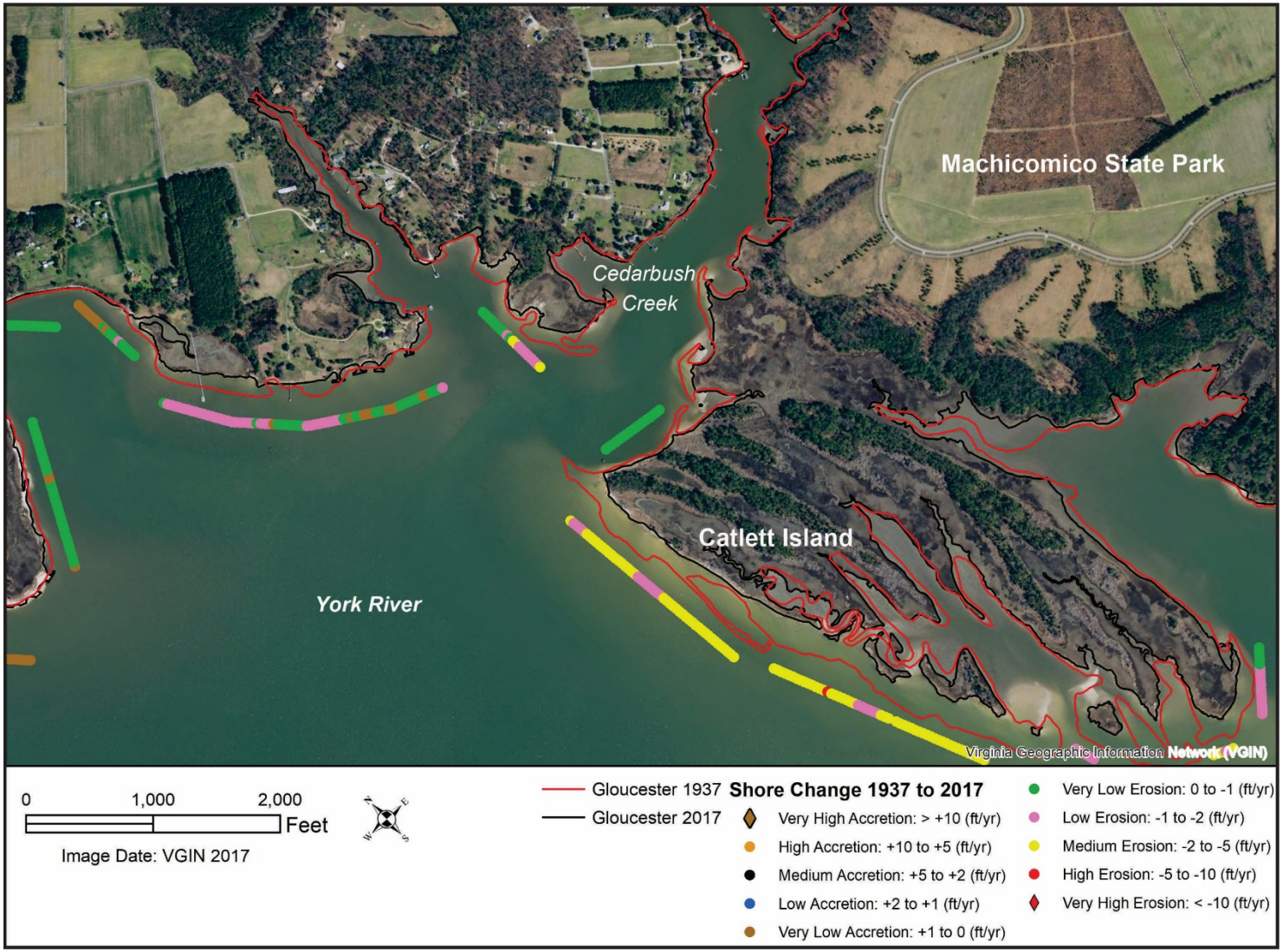


Figure 4. Cedarbush Creek on the 2017 VGIN image showing the 1937 and 2017 shorelines and 1937-2017 end point rate of change categorization. From Shoreline Studies Program Shoreline Change Database.

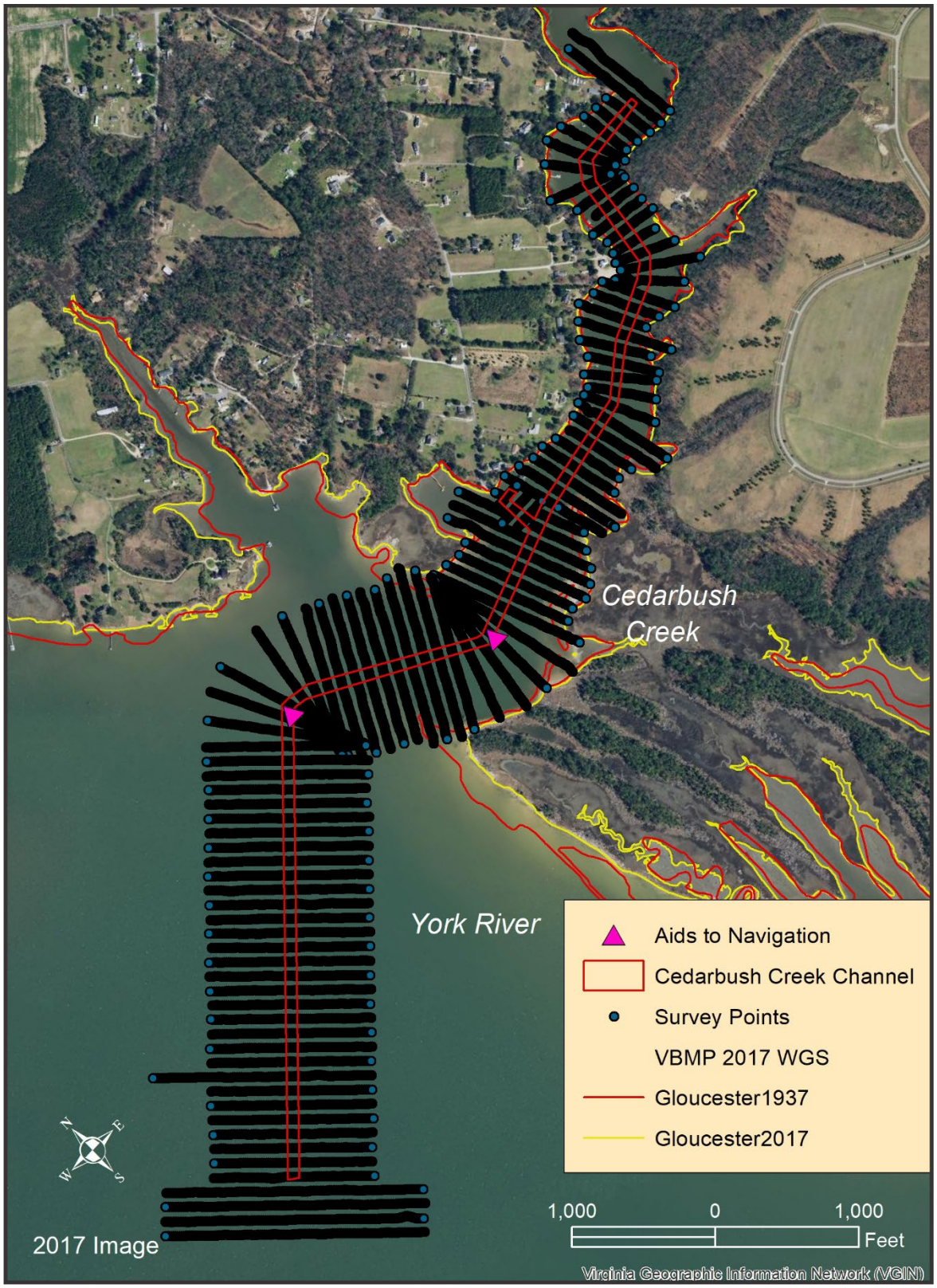


Figure 5. Survey points taken to determine existing bottom elevations at Cedarbush Creek.

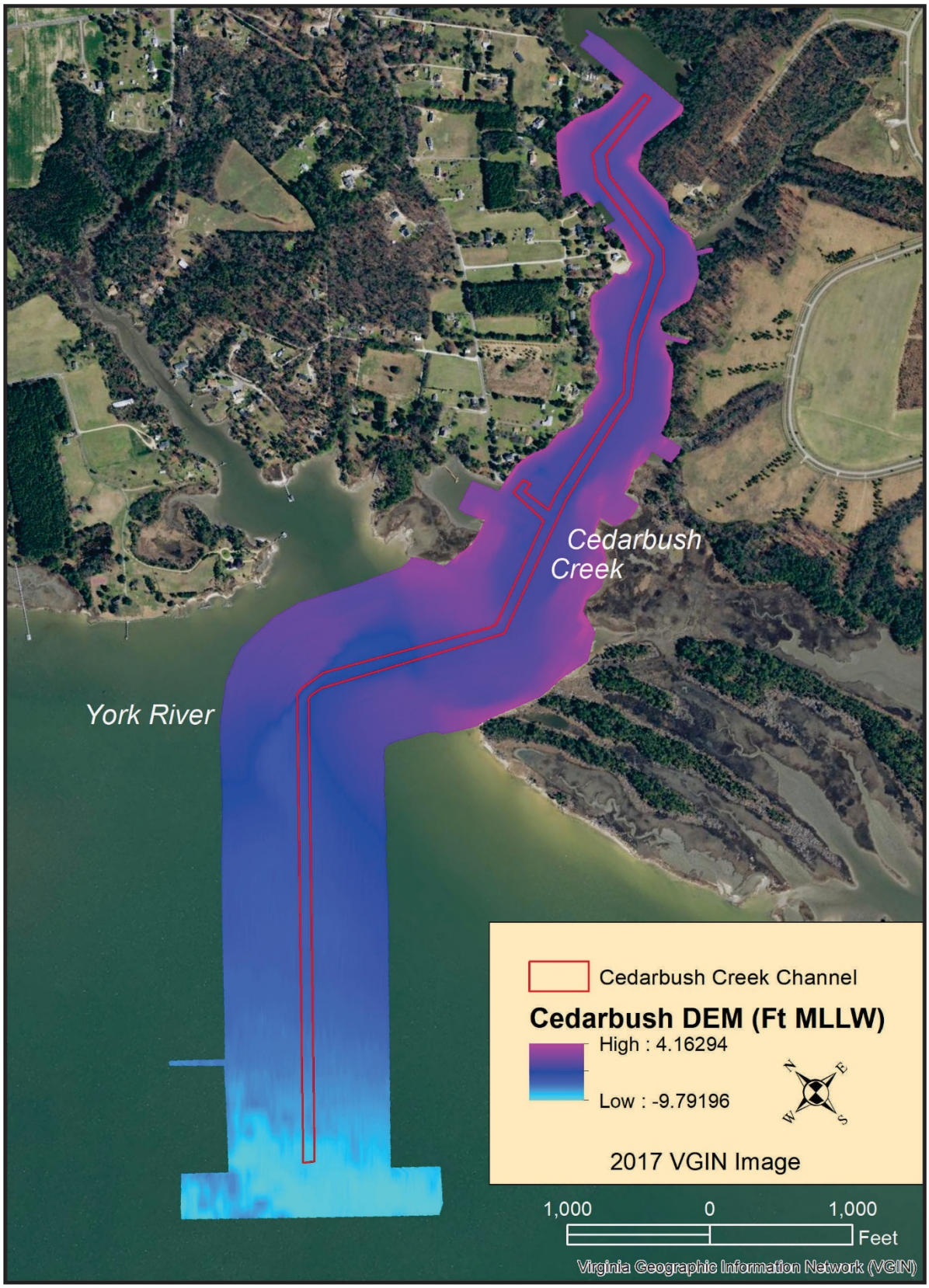


Figure 6. Digital Elevation Model (DEM) derived from survey points showing existing bathymetry of Cedarbush Creek.

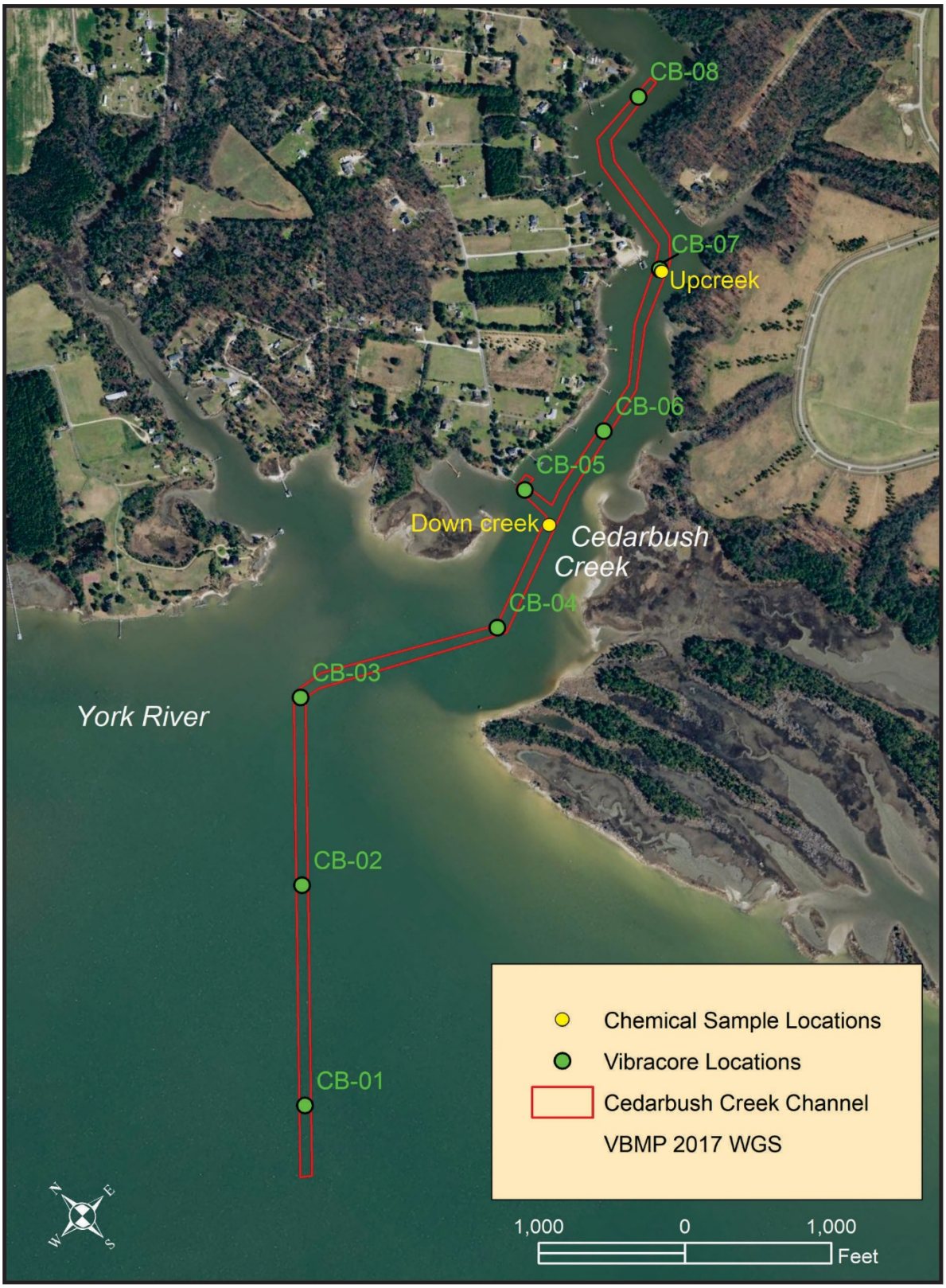


Figure 7. Location of vibracores and chemical samples taken in Cedarbush Creek.

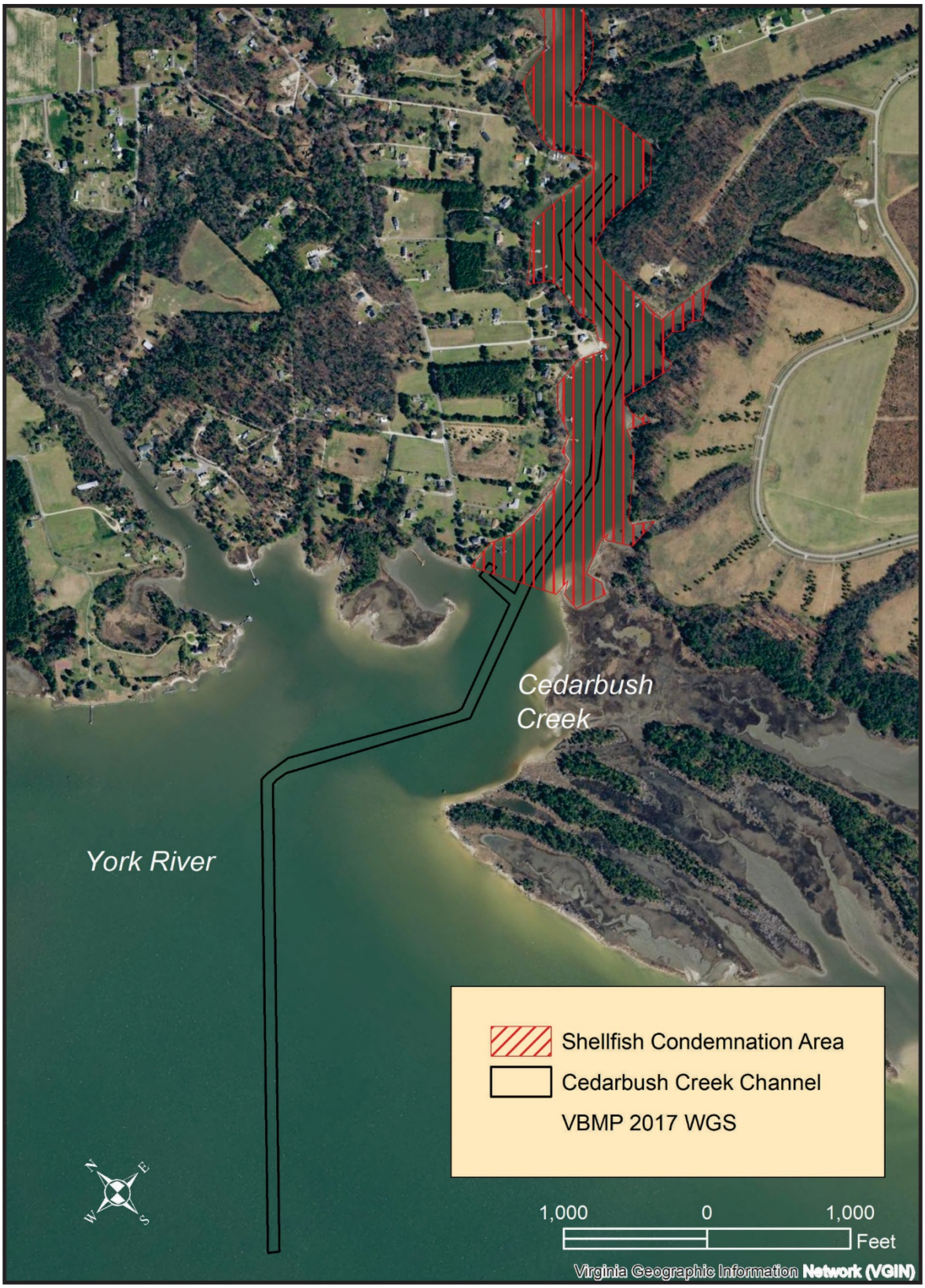


Figure 8. The areas of Cedarbush Creek that have been condemned for shellfish harvesting. From https://webapps.mrc.virginia.gov/public/maps/chesapeakebay_map.php

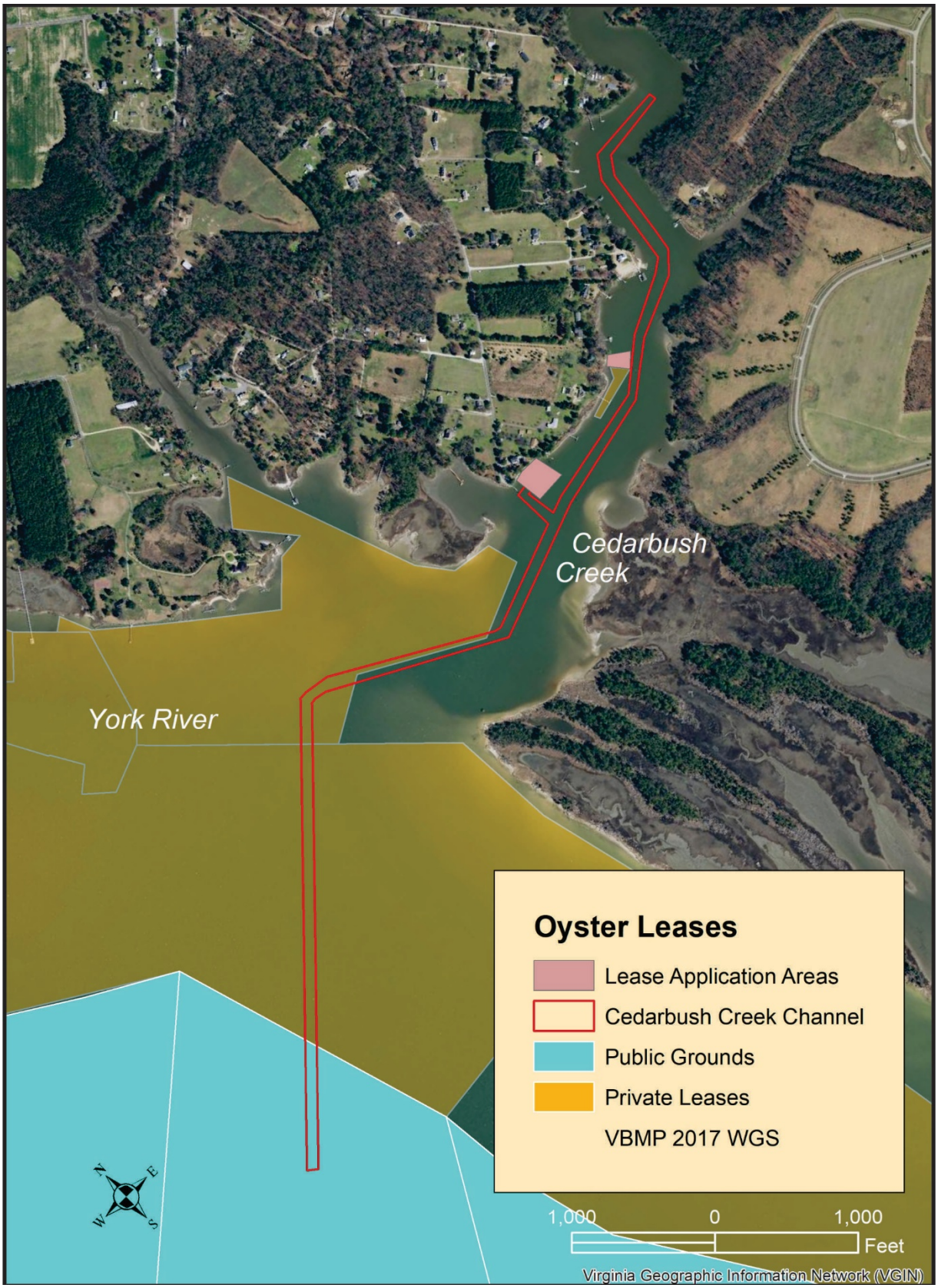


Figure 9. Private oyster ground leases and public bottom that will be affected by the proposed Cedarbush navigation channel. From webapps.mrc.virginia.gov/public/maps/chesapeakebay_map.php

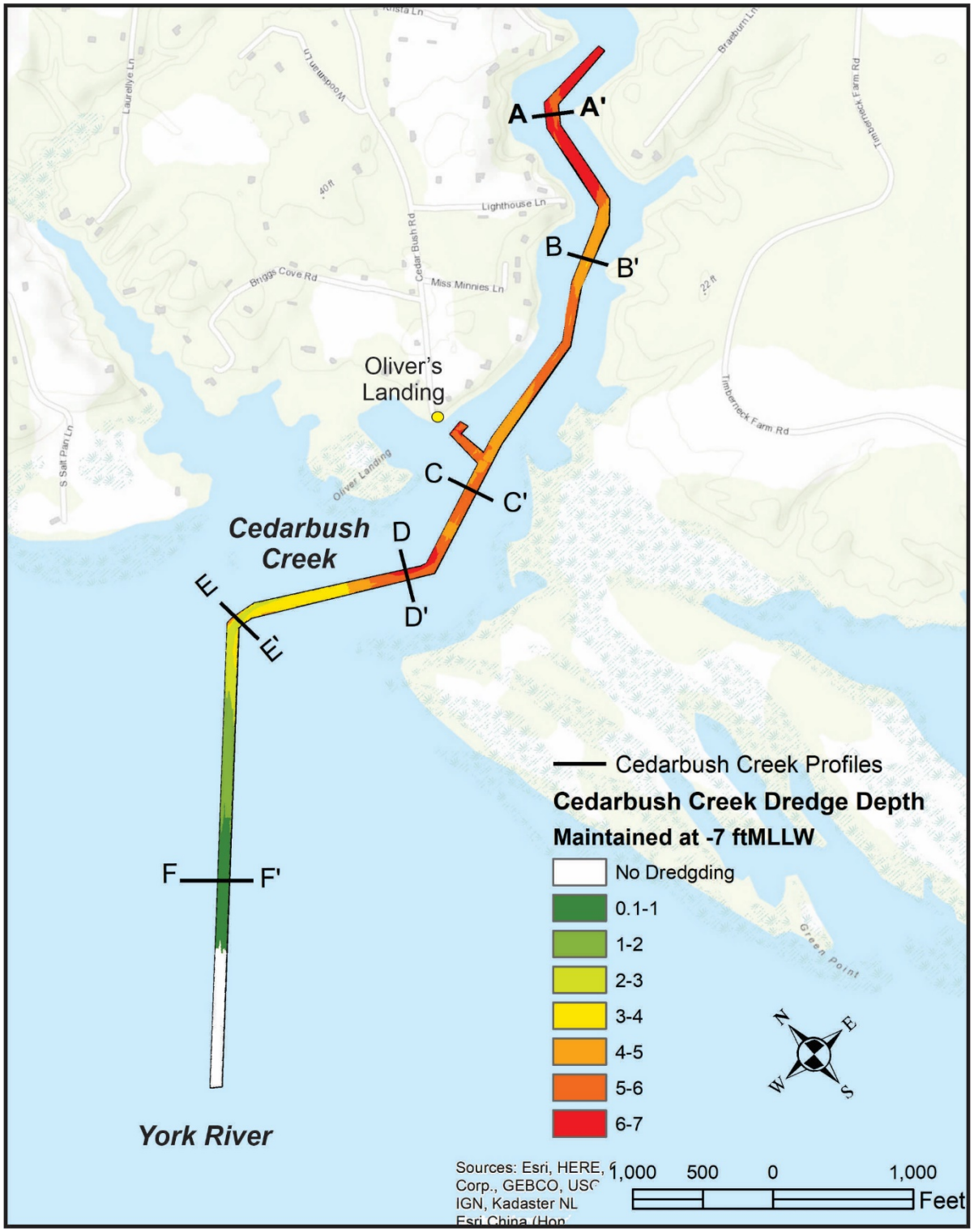


Figure 10. Digital elevation model (DEM) showing the locations in the channel that are shallower than -7 ft MLLW. Areas that need more material removed are shown in red. Areas that need less material removed are shown in green. Areas deeper than -7 ft ML MLLW. The volume of material was calculated for the channel area inland of Oliver's Landing and riverward of the Landing.

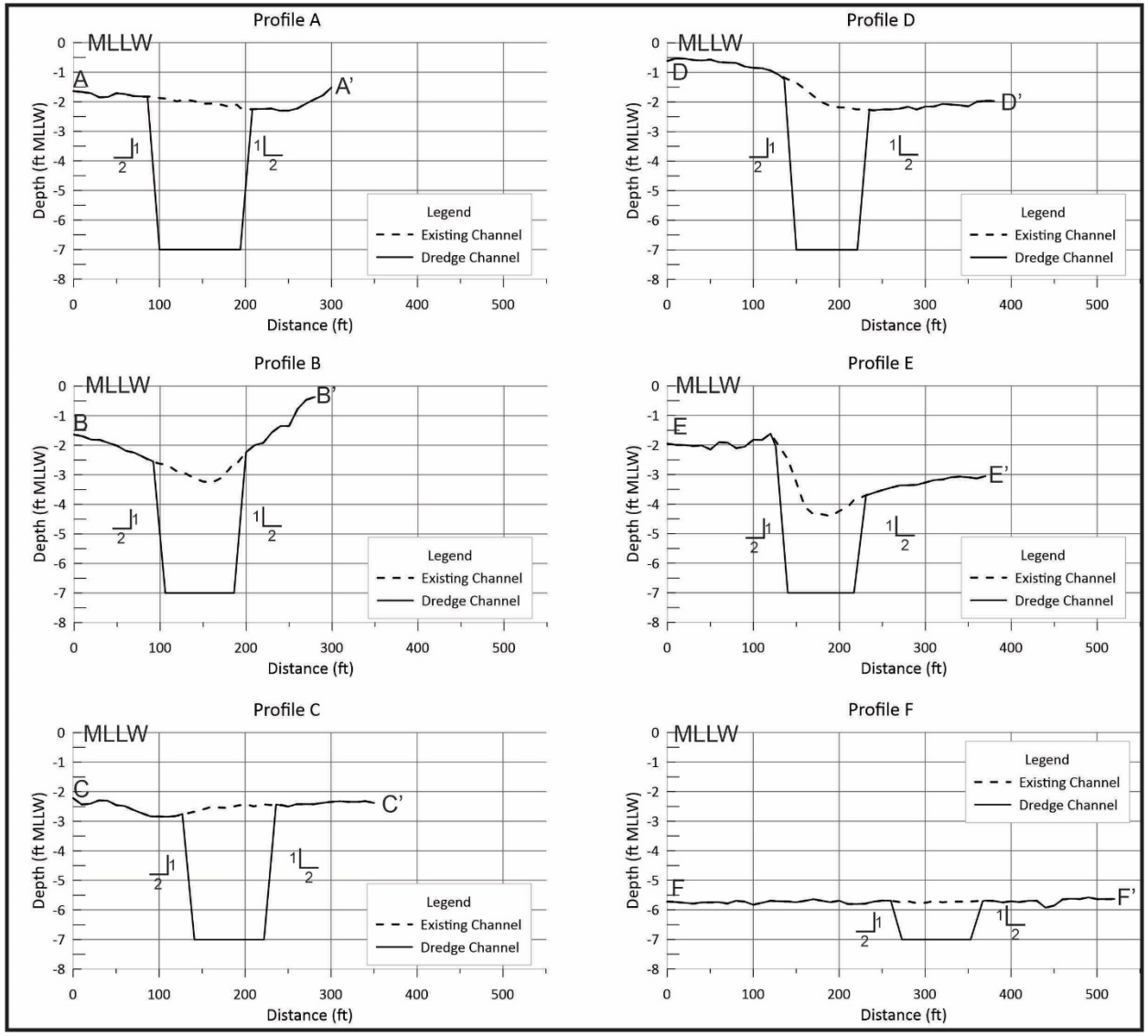


Figure 11. Typical channel cross-sections looking up-creek at Cedarbush. Their location is shown on Figure 10.

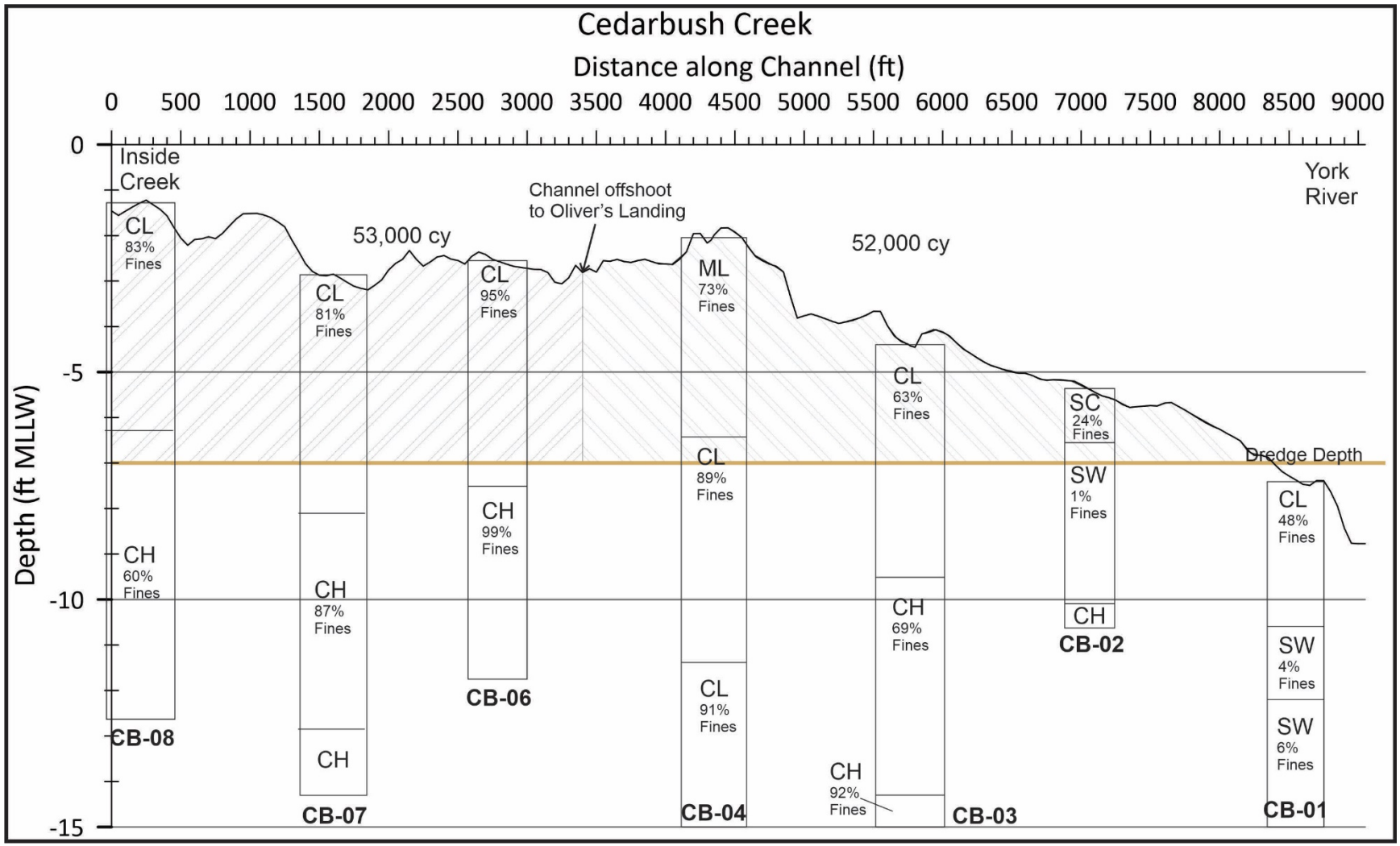


Figure 12. Along-channel cross-section showing the position of the cores and the type of material in the core. The dredge depth is -7 ft MLLW. The volume of material was calculated for the channel area inland of Oliver's Landing and riverward of the Land.

Figure 13. Example photo of a Geotube® used for sediment containment. Source: TenCate website.

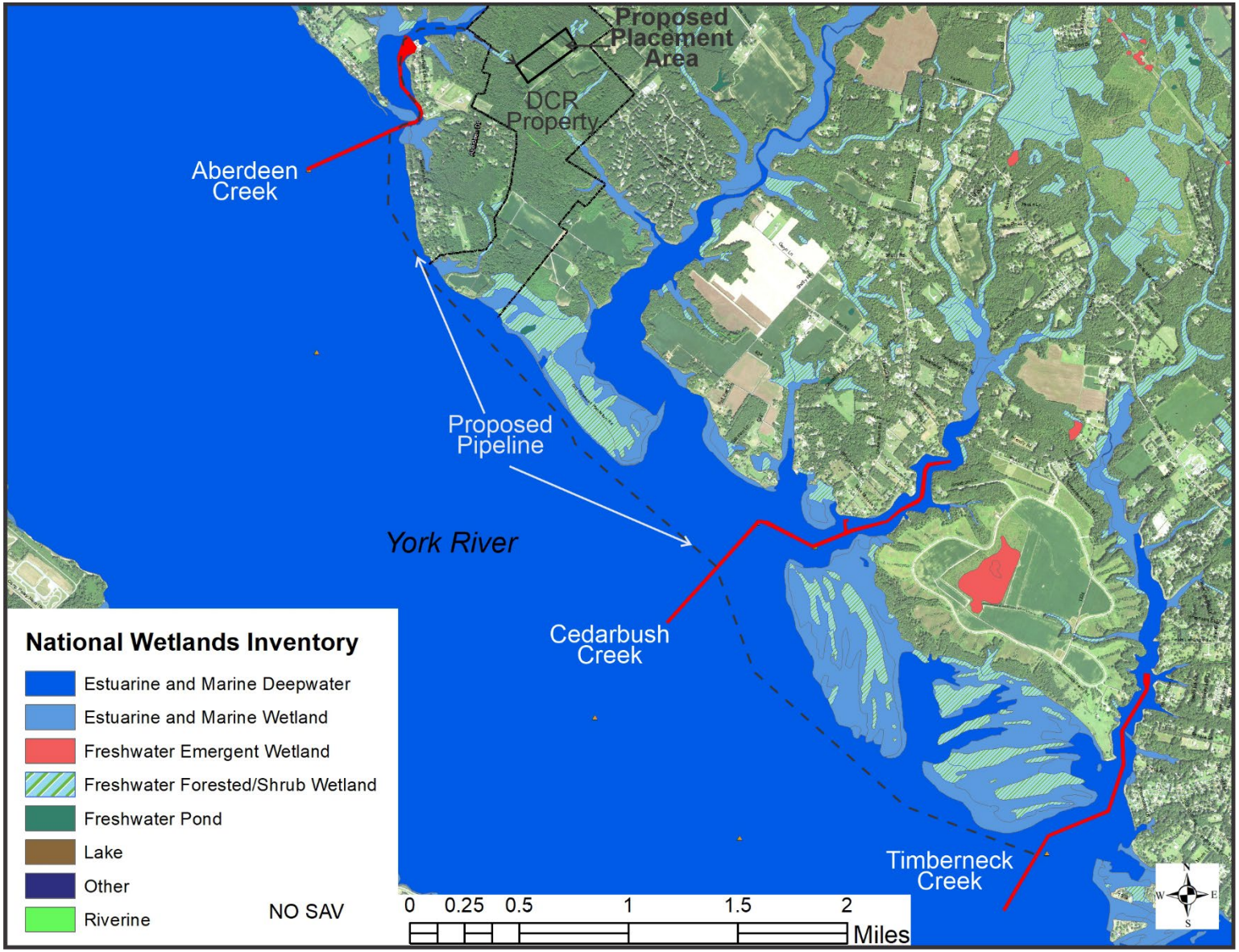


Figure 14. Potential confined upland disposal areas for dredge material placement. Middle Peninsula DCR property boundary shown in black. Also shown is the National Wetlands Inventory.

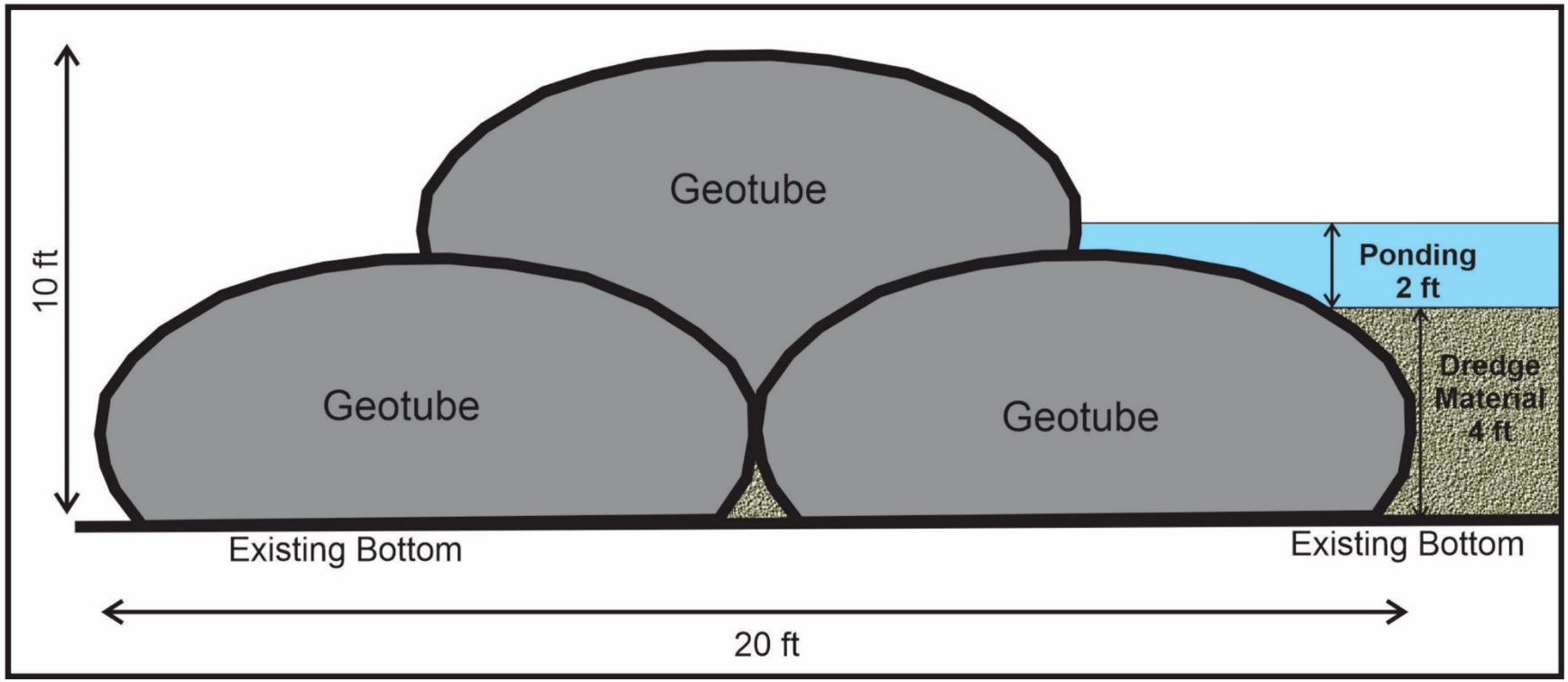


Figure 15. Configuration of Geotube® confined upland disposal site.

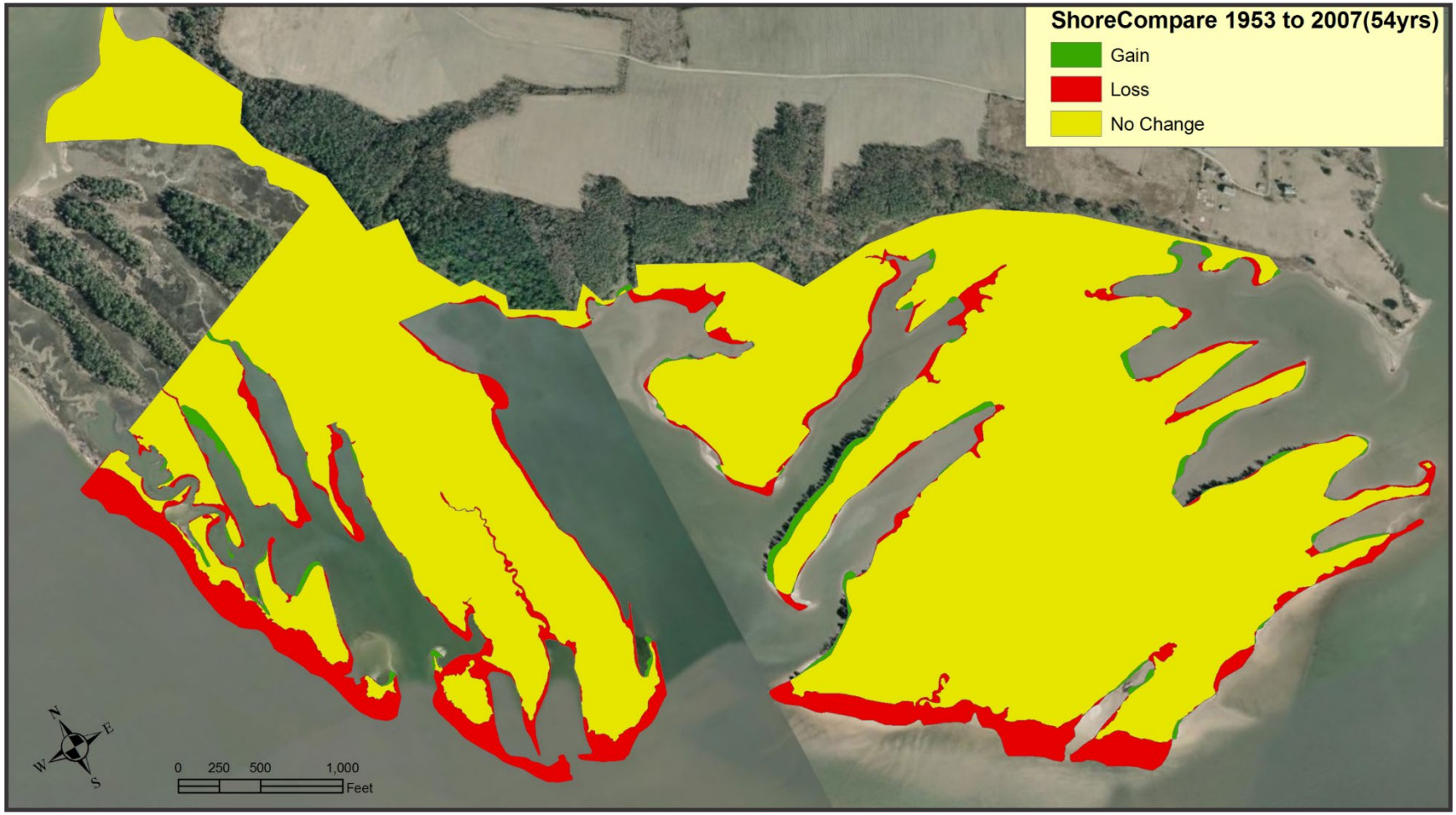


Figure 16. Map showing the area of shoreline change at Catlett Islands between 1953 and 2007. From Hardaway et al. (2012).

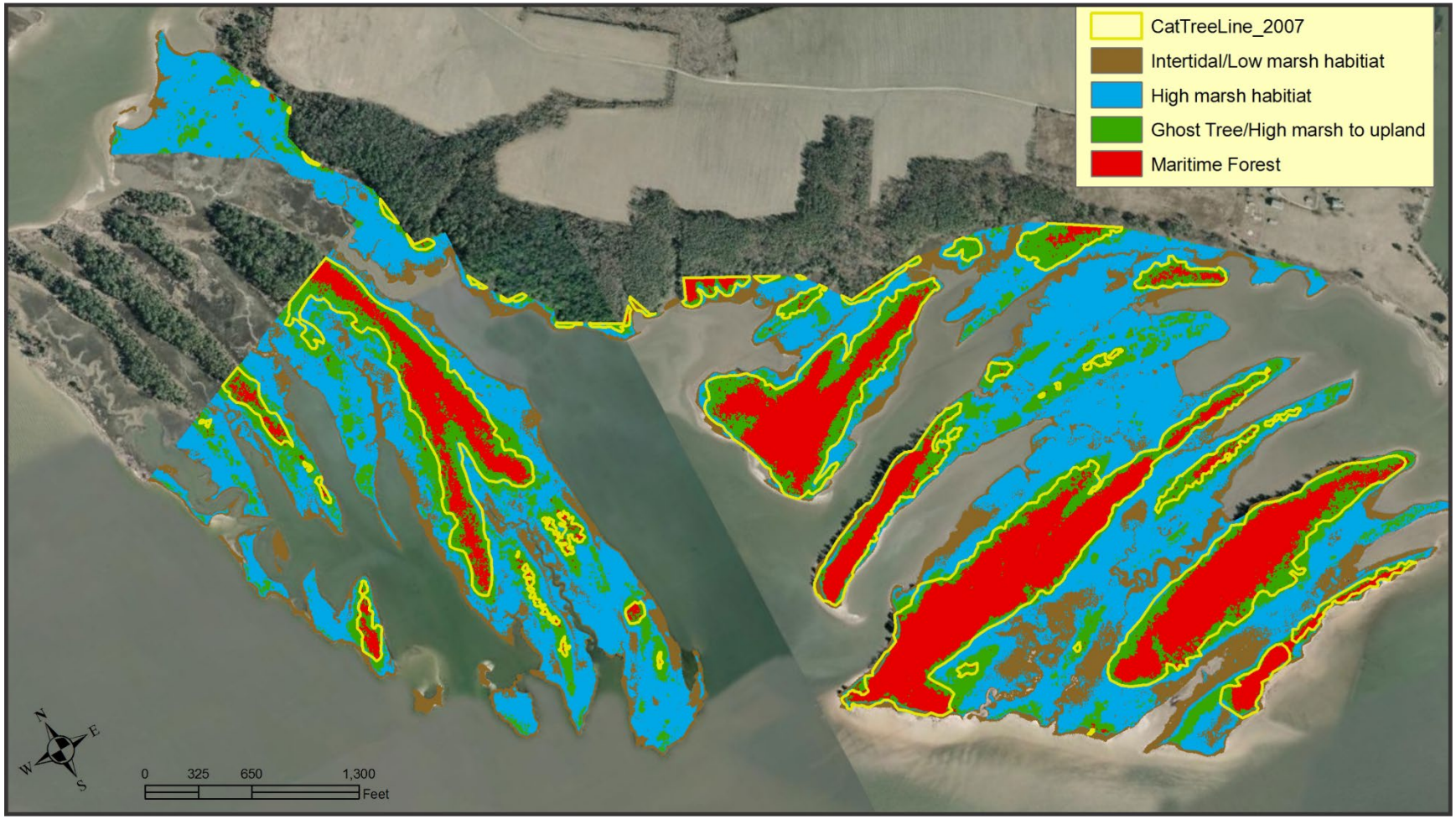


Figure 17. Habitats present at Catlett Islands in 2007. From Hardaway et al. (2012).

Figure 18. Location of proposed demonstration project at Catlett Islands using material from Timberneck dredging.

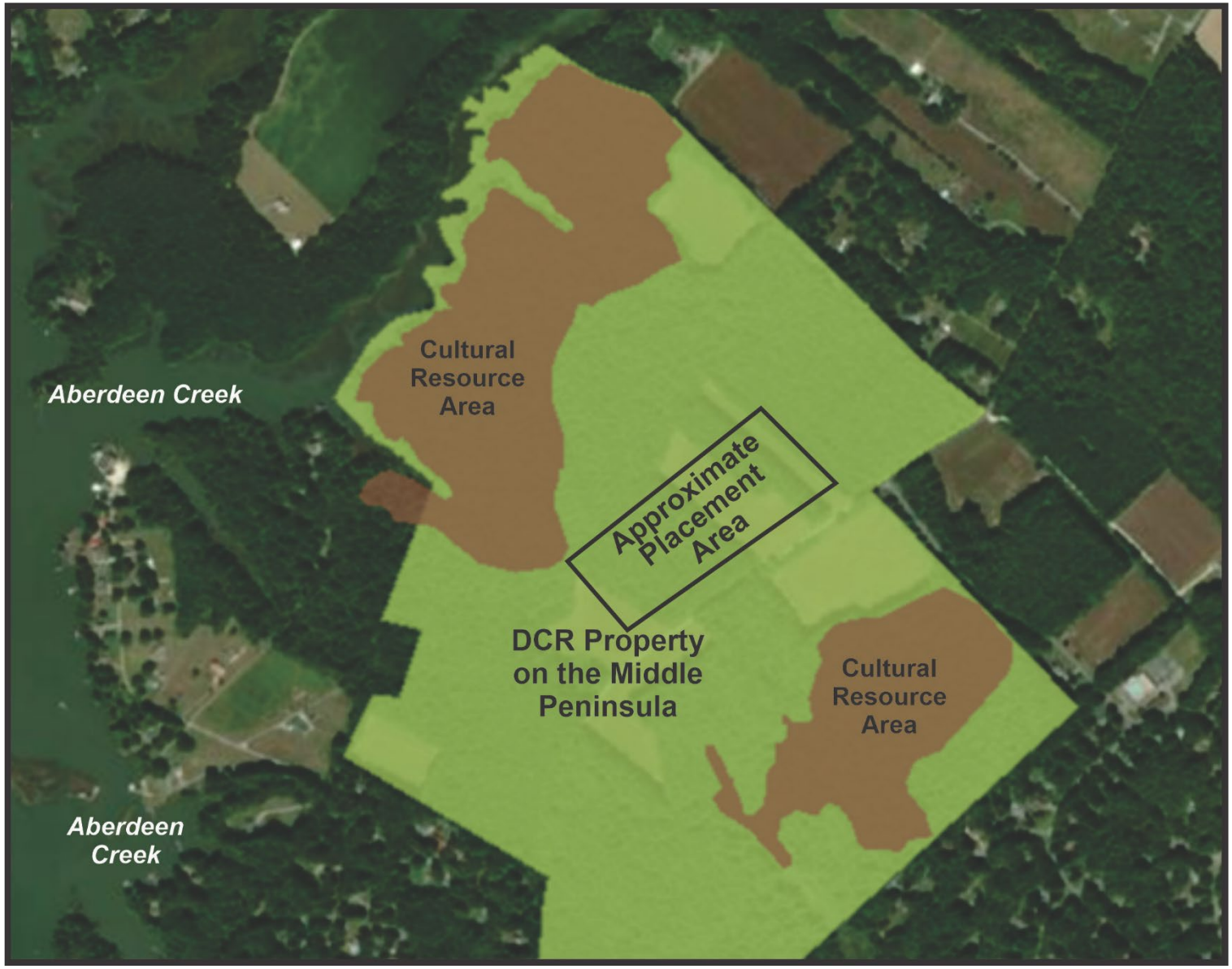


Figure 19. Location of cultural resource areas within DCR property on the Middle Peninsula adjacent to Aberdeen Creek. Source: Tom Smith, Deputy Director of Operations, VA Department of Conservation and Recreation.

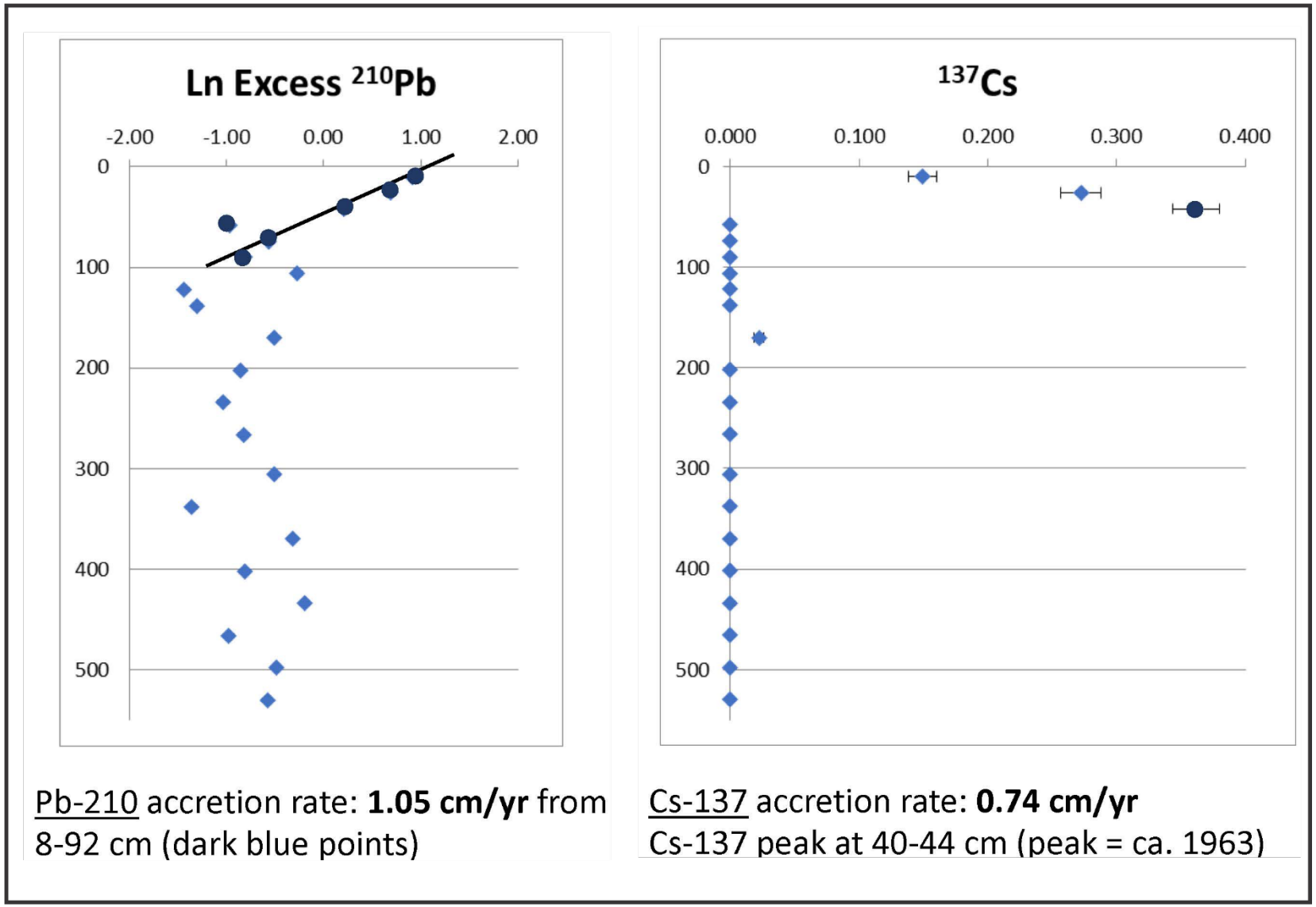
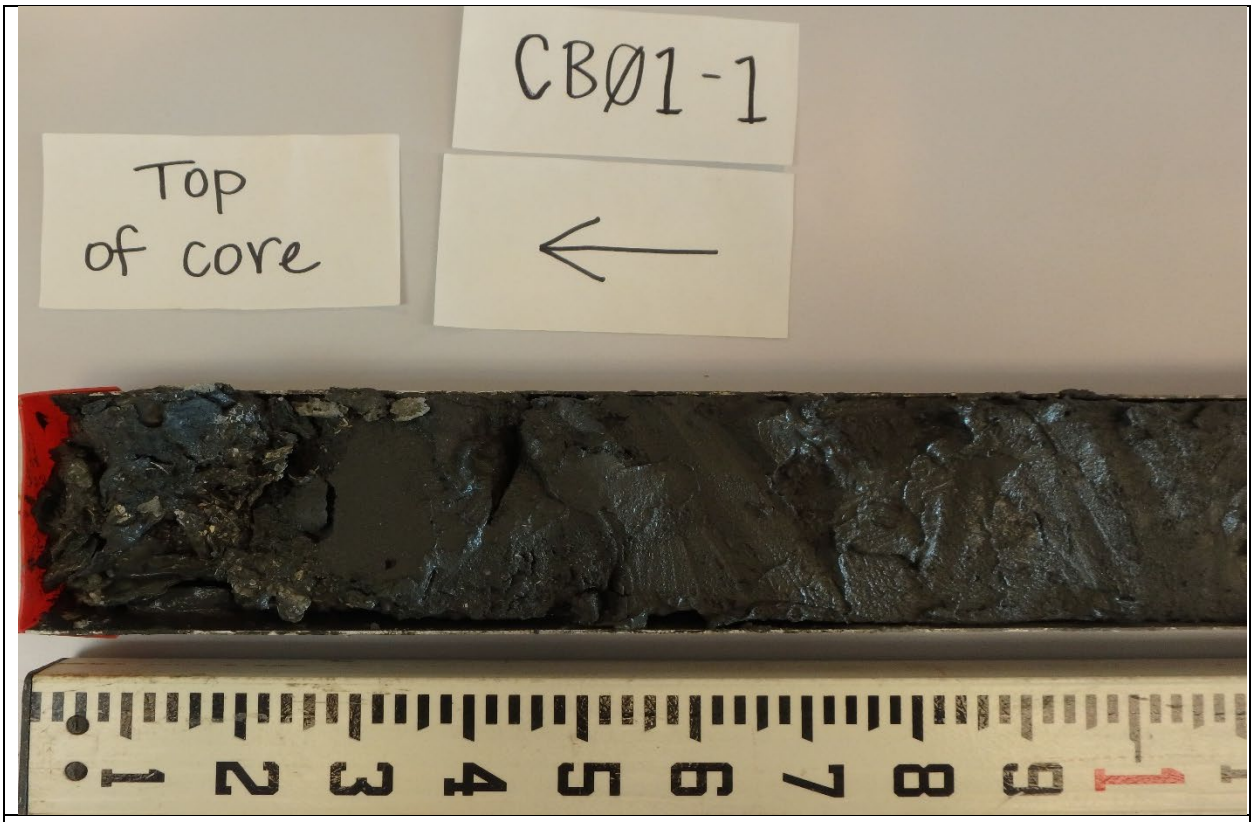


Figure 20. Result plots from the 210Pb and 137Cs testing showing the modeled sedimentation rates.

Appendix A

Core Photographs

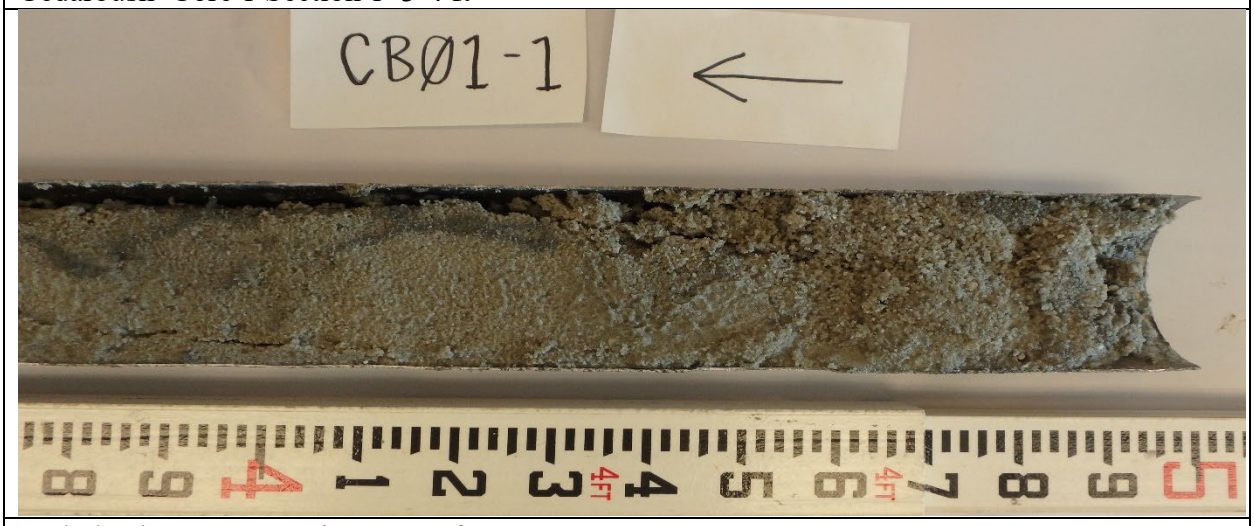


Cedarbush Core 1 Section 1 0-1 ft

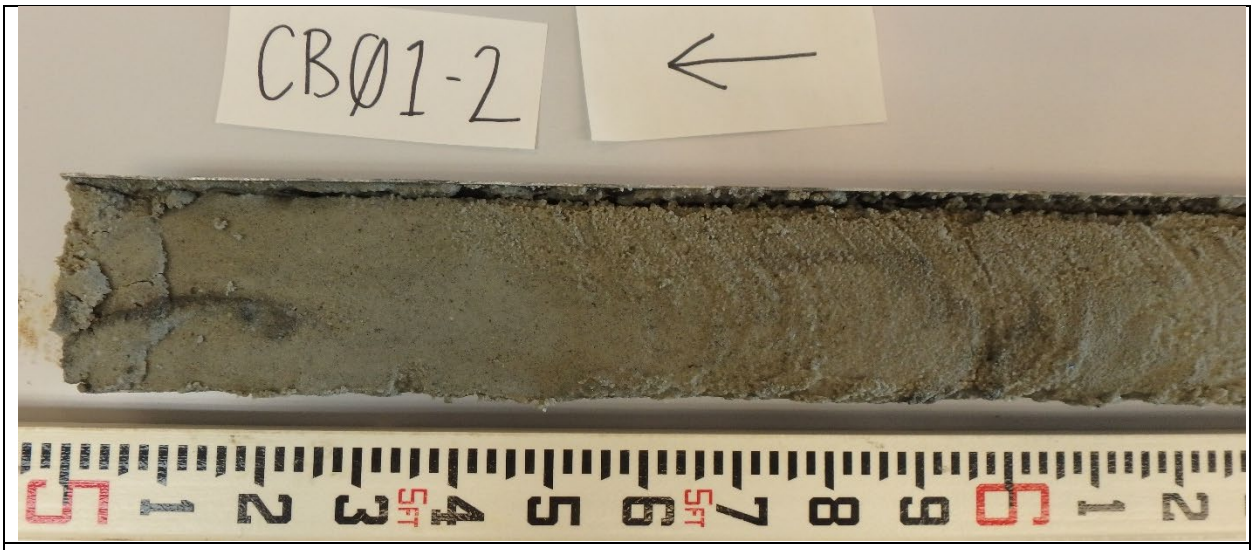
Cedarbush Core 1 Section 1 1-2 ft

Cedarbush Core 1 Section 1 2-3 ft

Cedarbush Core 1 Section 1 3-4 ft



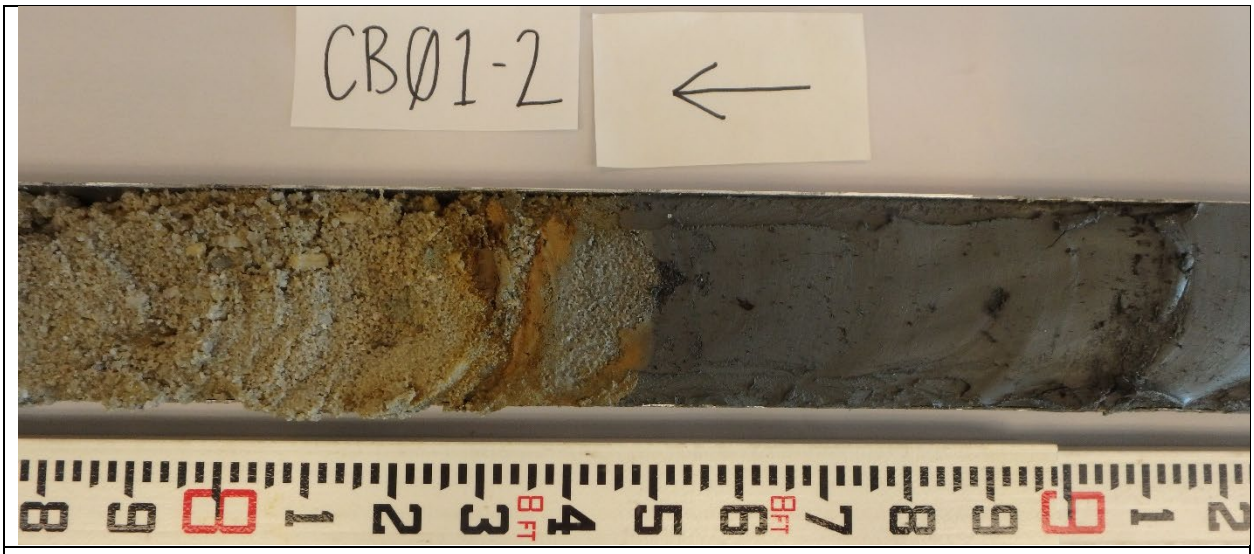
Cedarbush Core 1 Section 1 4-5 ft



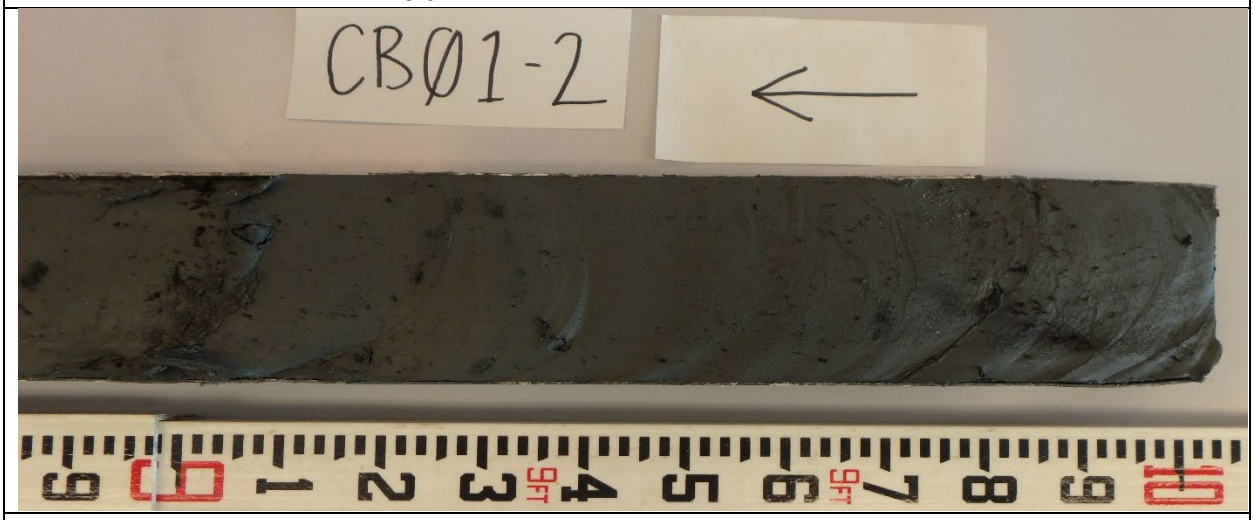
Cedarbush Core 1 Section 2 5-6 ft

Cedarbush Core 1 Section 2 6-7 ft

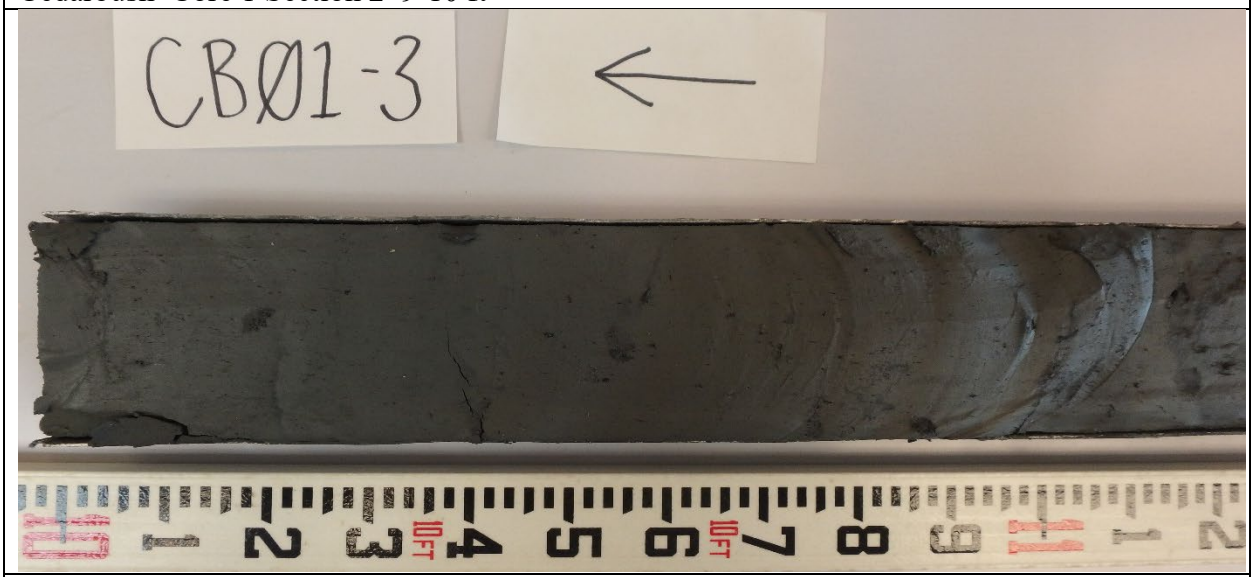
Cedarbush Core 1 Section 2 7-8 ft



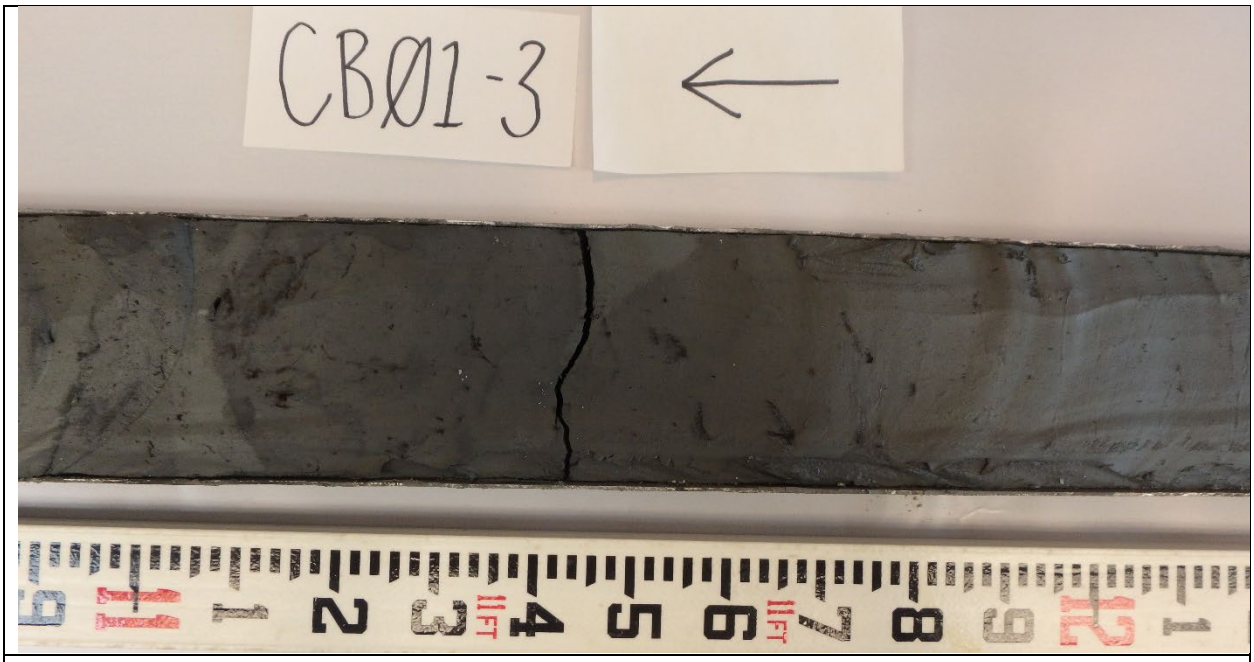
Cedarbush Core 1 Section 2 8-9 ft



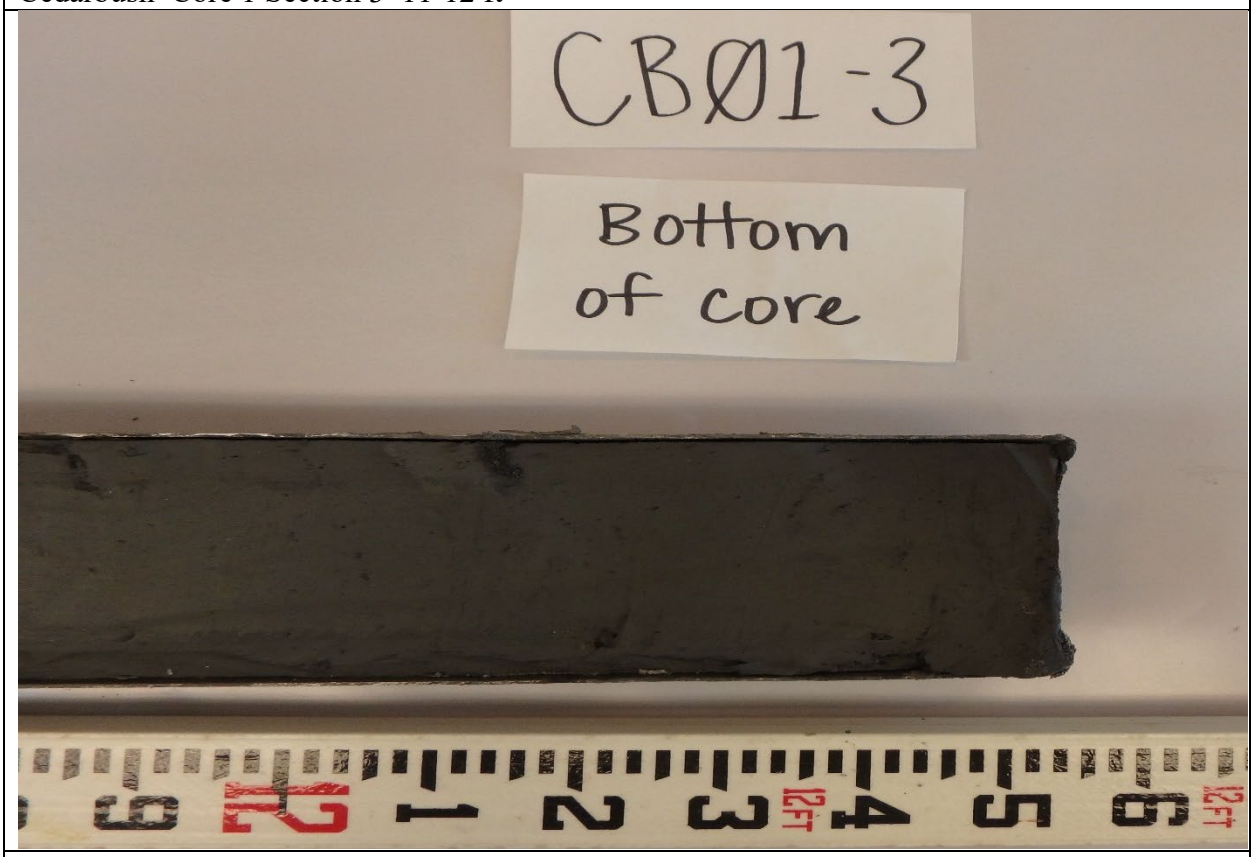
Cedarbush Core 1 Section 2 9-10 ft



Cedarbush Core 1 Section 3 10-11 ft



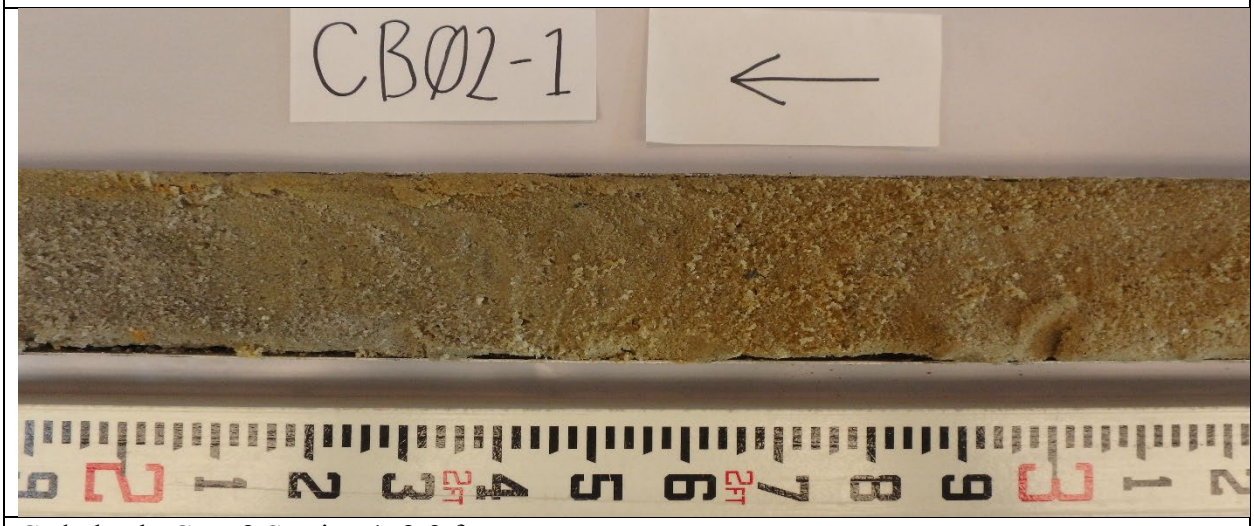
Cedarbush Core 1 Section 3 11-12 ft



Cedarbush Core 1 Section 11.9-12.5 ft

Cedarbush Core 2 Section 1 0-1 ft

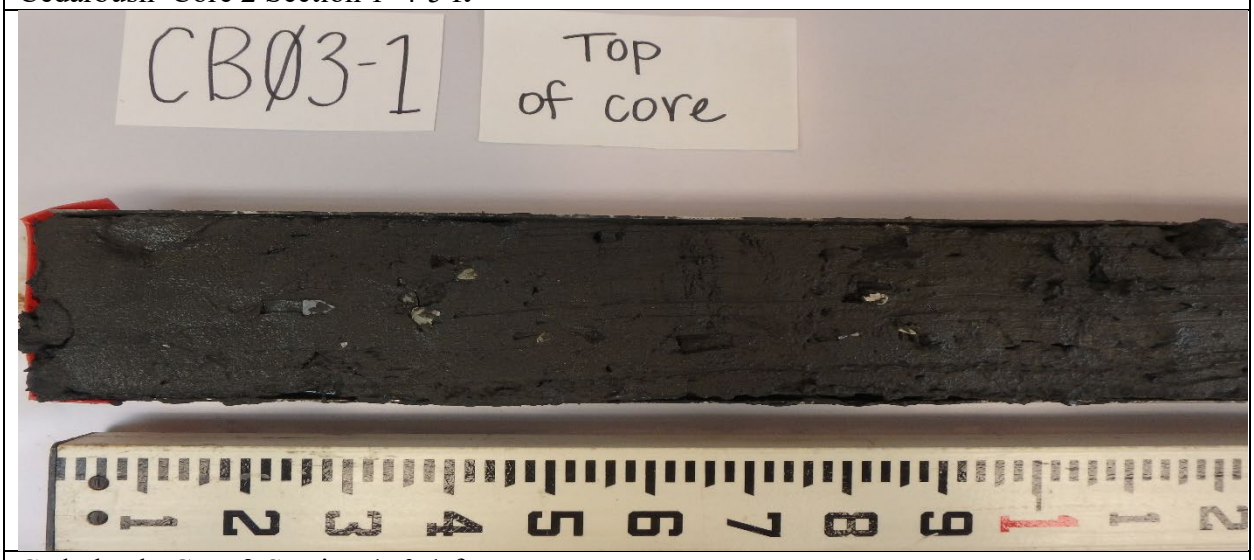
Cedarbush Core 2 Section 1 1-2 ft



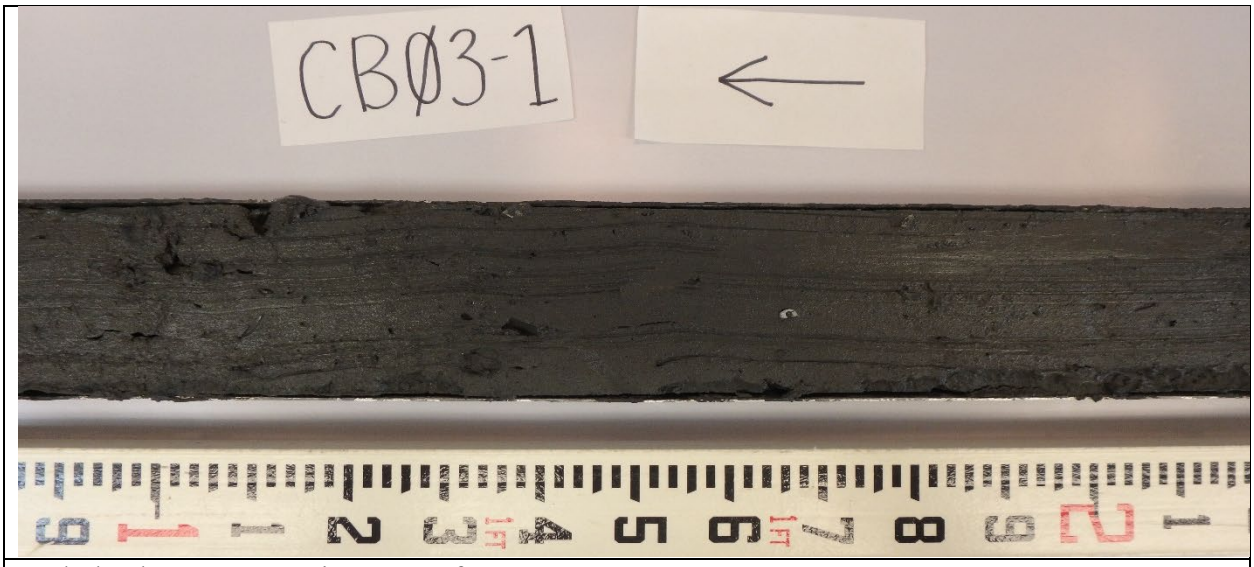
Cedarbush Core 2 Section 1 2-3 ft

Cedarbush Core 2 Section 1 3-4 ft

Cedarbush Core 2 Section 1 4-5 ft



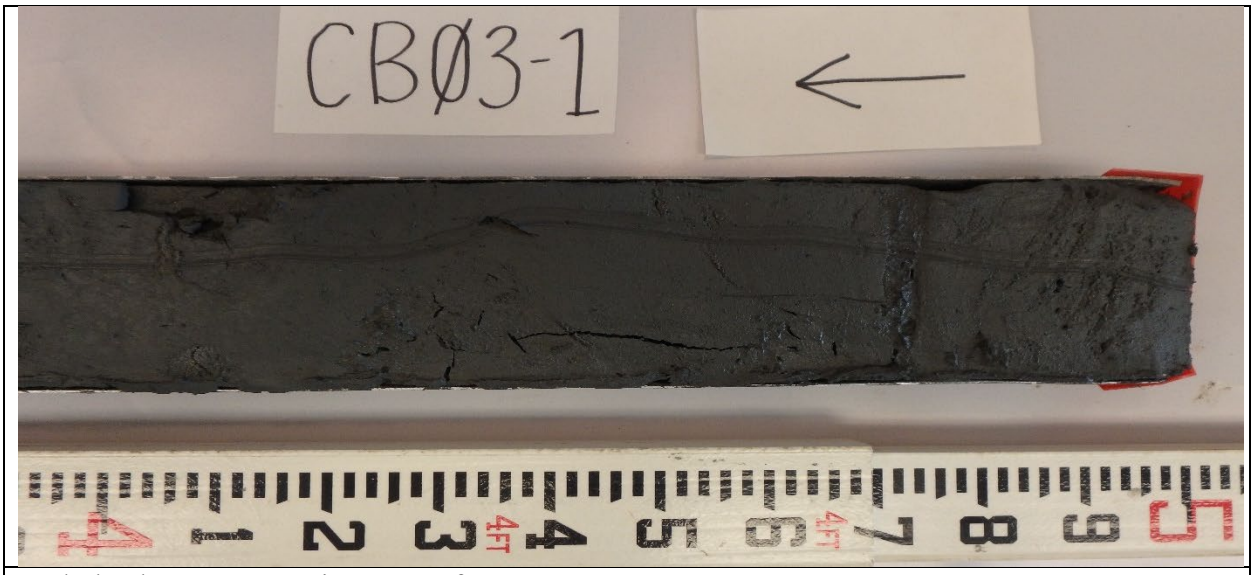
Cedarbush Core 3 Section 1 0-1 ft



Cedarbush Core 3 Section 1 1-2 ft

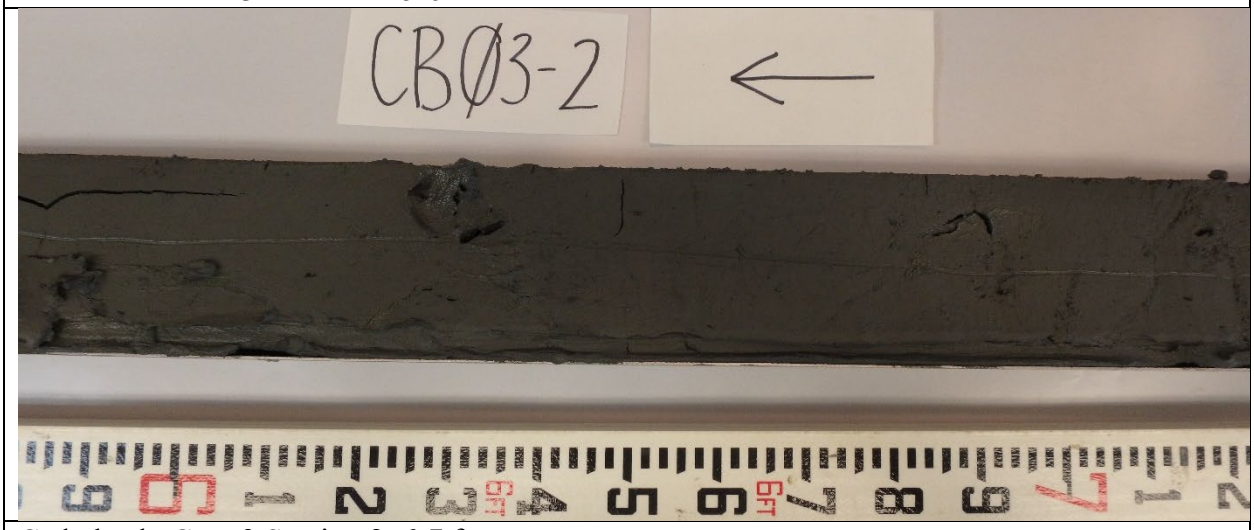
Cedarbush Core 3 Section 1 2-3 ft

Cedarbush Core 3 Section 1 3-4 ft

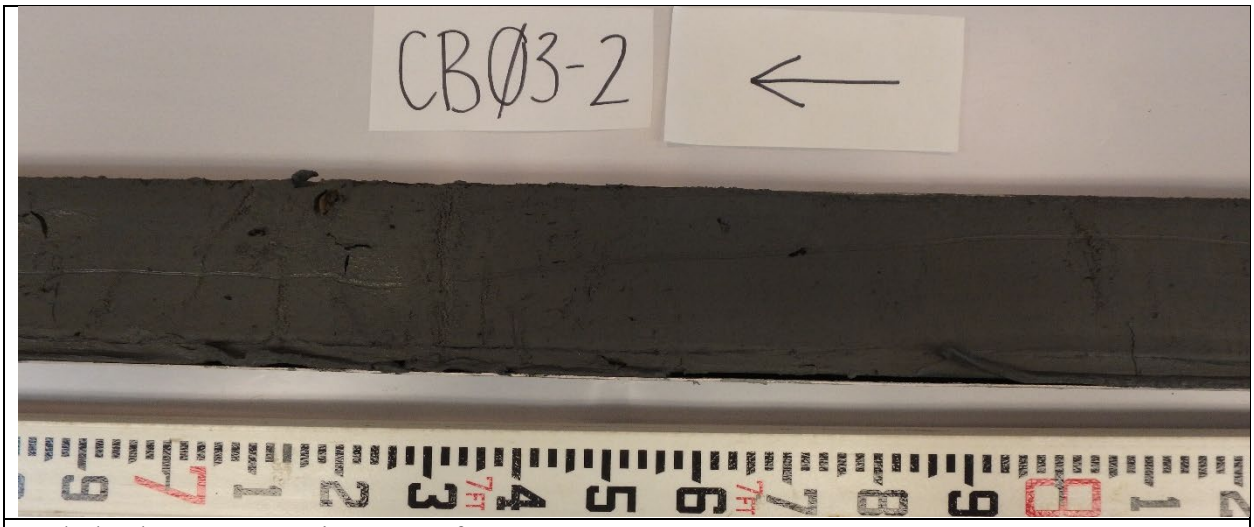


Cedarbush Core 3 Section 1 4-5 ft

Cedarbush Core 3 Section 2 5-6 ft

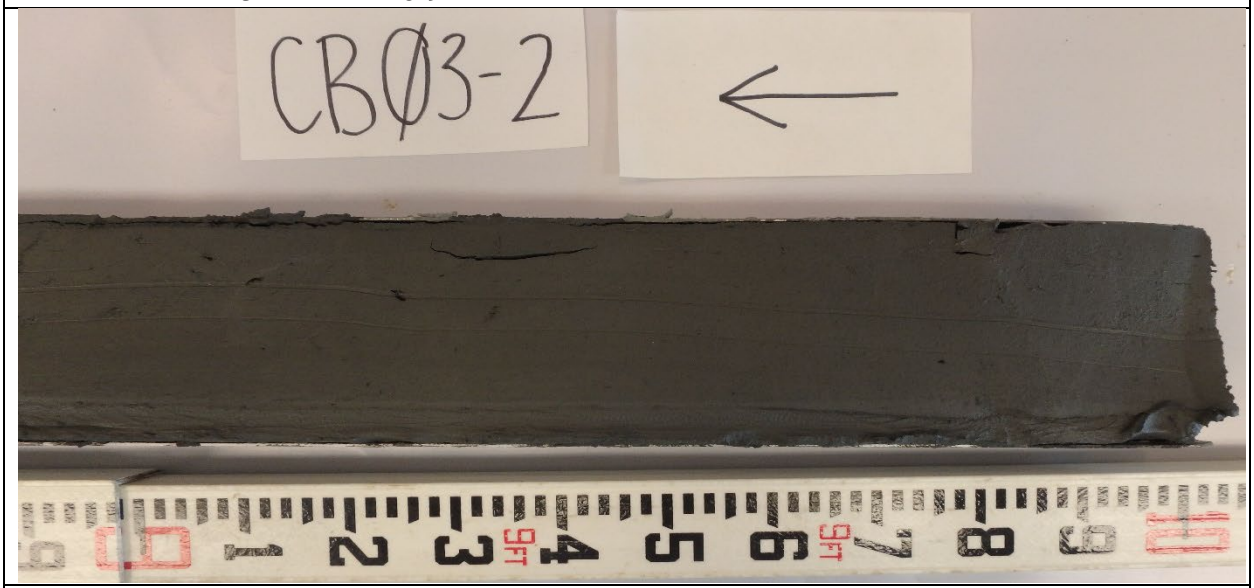


Cedarbush Core 3 Section 2 6-7 ft



Cedarbush Core 3 Section 2 7-8 ft

Cedarbush Core 3 Section 2 8-9 ft



Cedarbush Core 3 Section 2 9-10 ft

Cedarbush Core 3 Section 3 10-11 ft

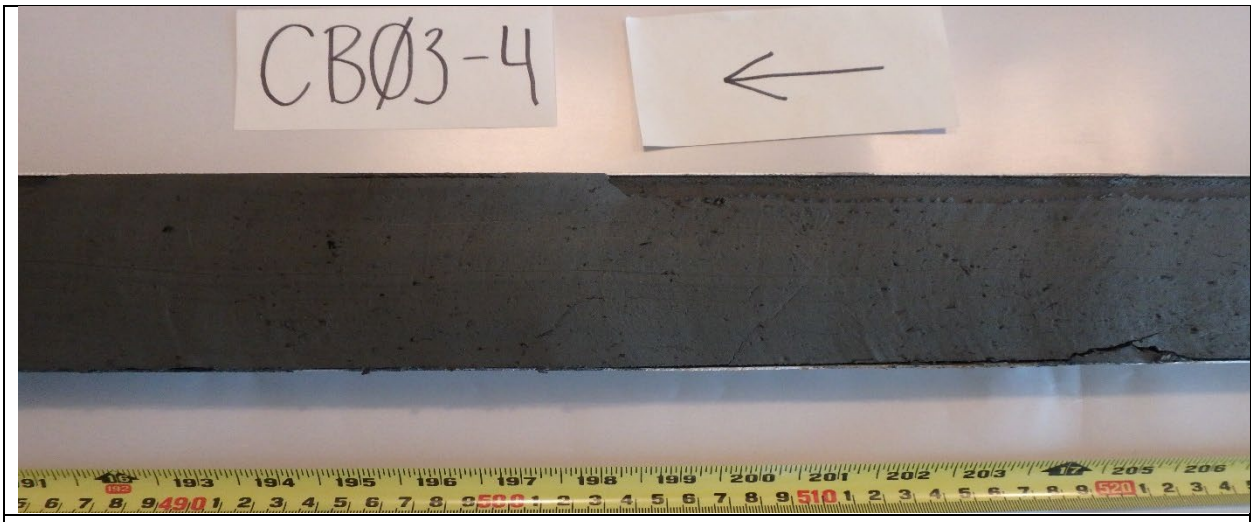
Cedarbush Core 3 Section 3 11-12 ft

Cedarbush Core 3 Section 3 12-13 ft

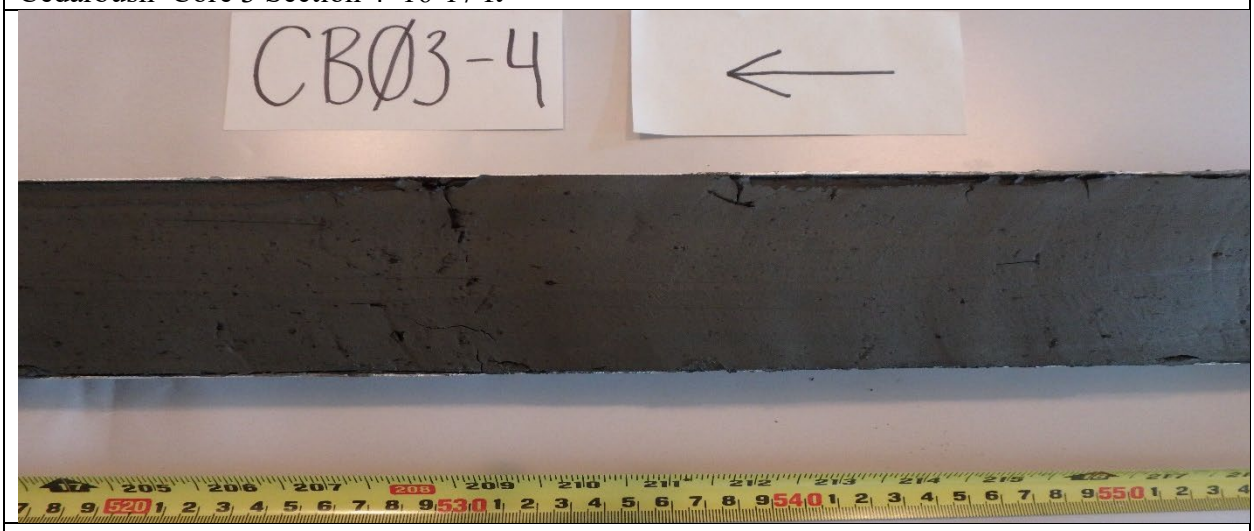
Cedarbush Core 3 Section 3 13-14 ft

Cedarbush Core 3 Section 3 14-15 ft

Cedarbush Core 3 Section 4 15-16 ft



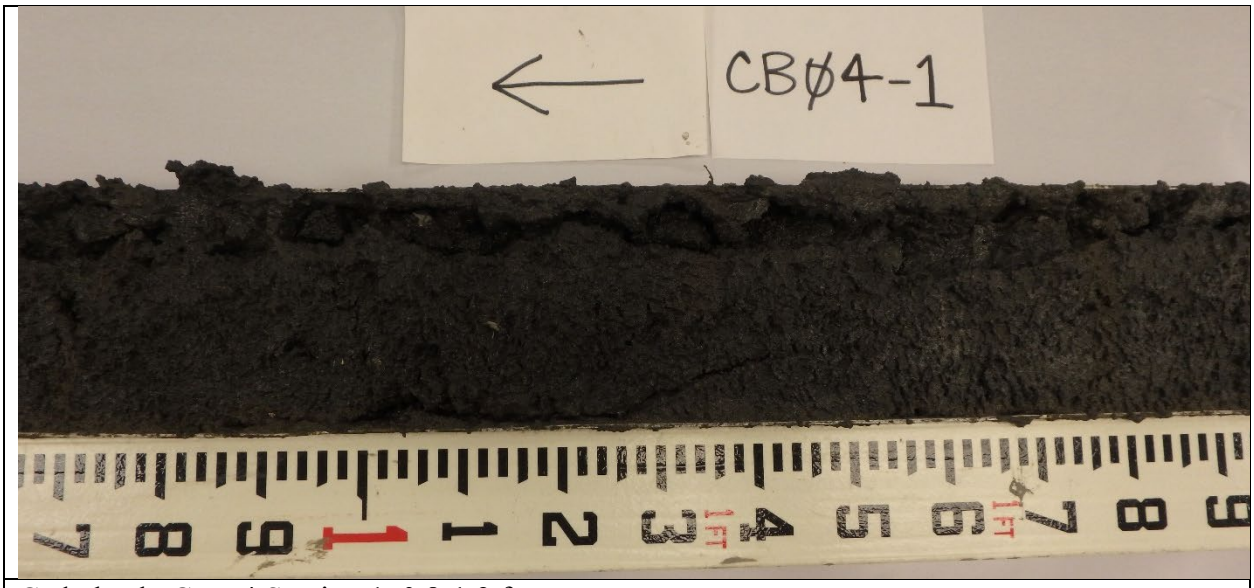
Cedarbush Core 3 Section 4 16-17 ft



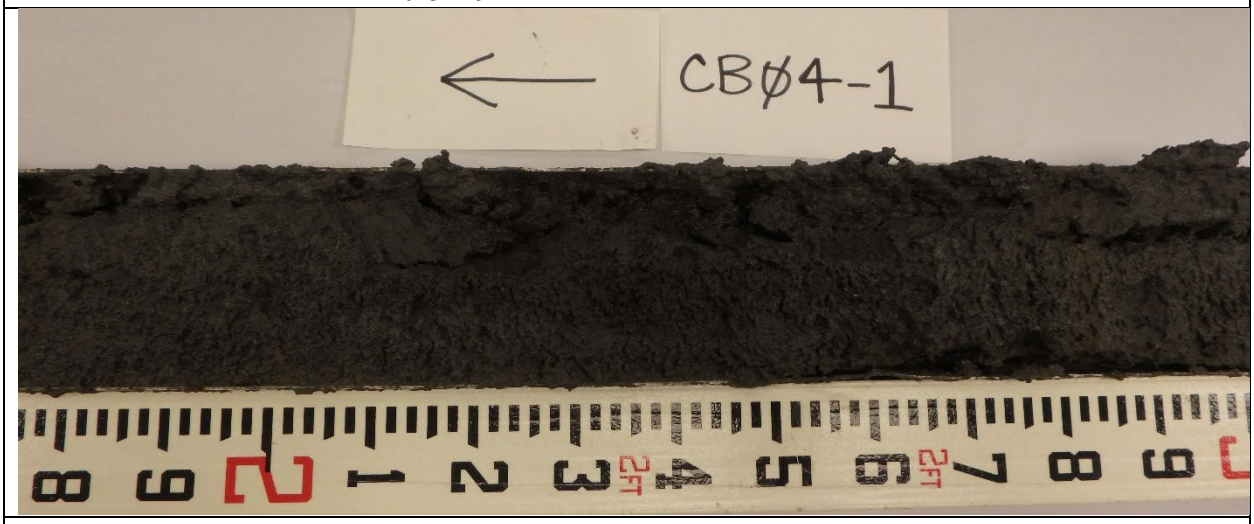
Cedarbush Core 3 Section 4 17-18 ft

Cedarbush Core 3 Section 4 17.8-18.5 ft

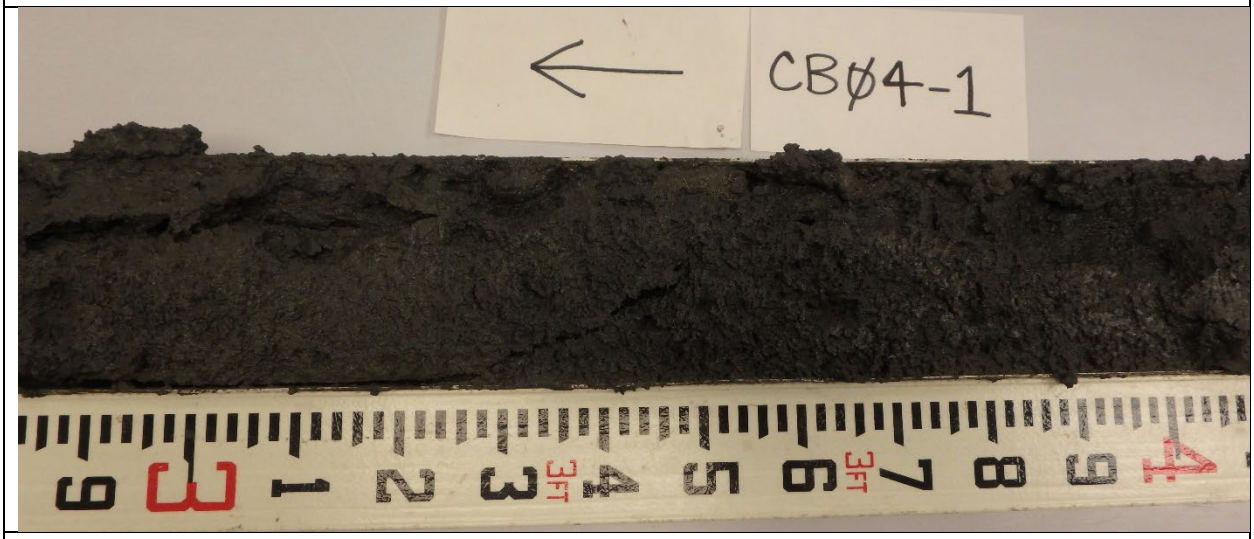
Cedarbush Core 4 Section 1 0-0.8 ft



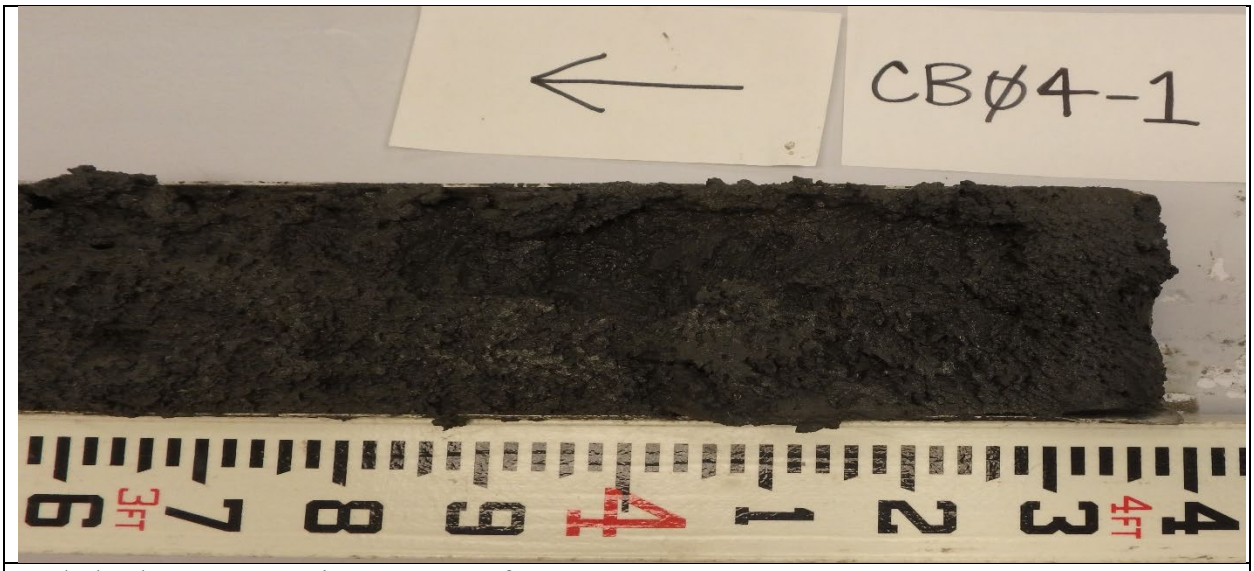
Cedarbush Core 4 Section 1 0.8-1.9 ft



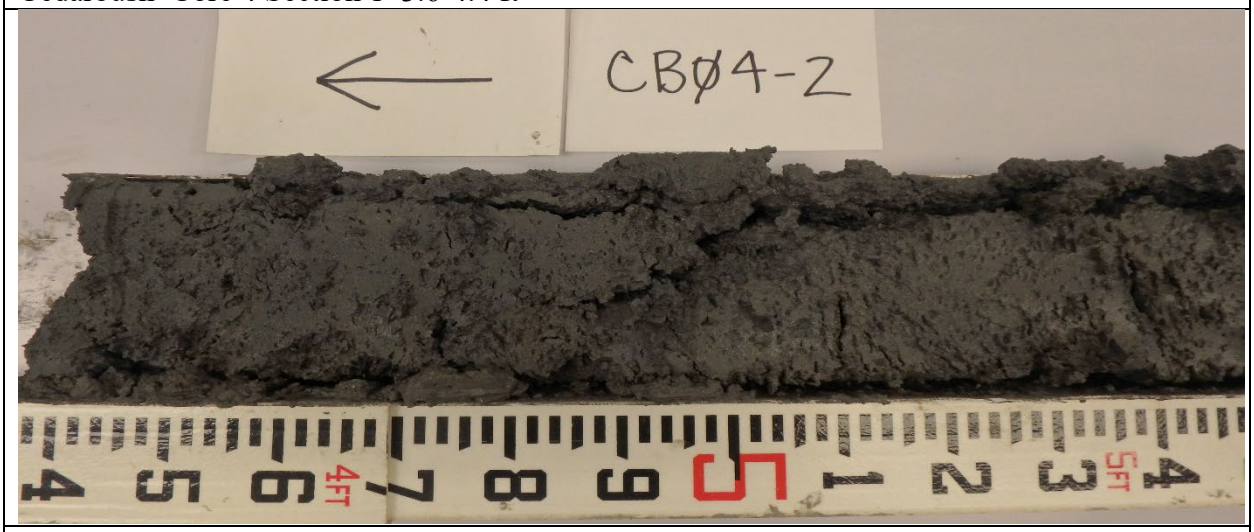
Cedarbush Core 4 Section 1 2-3 ft



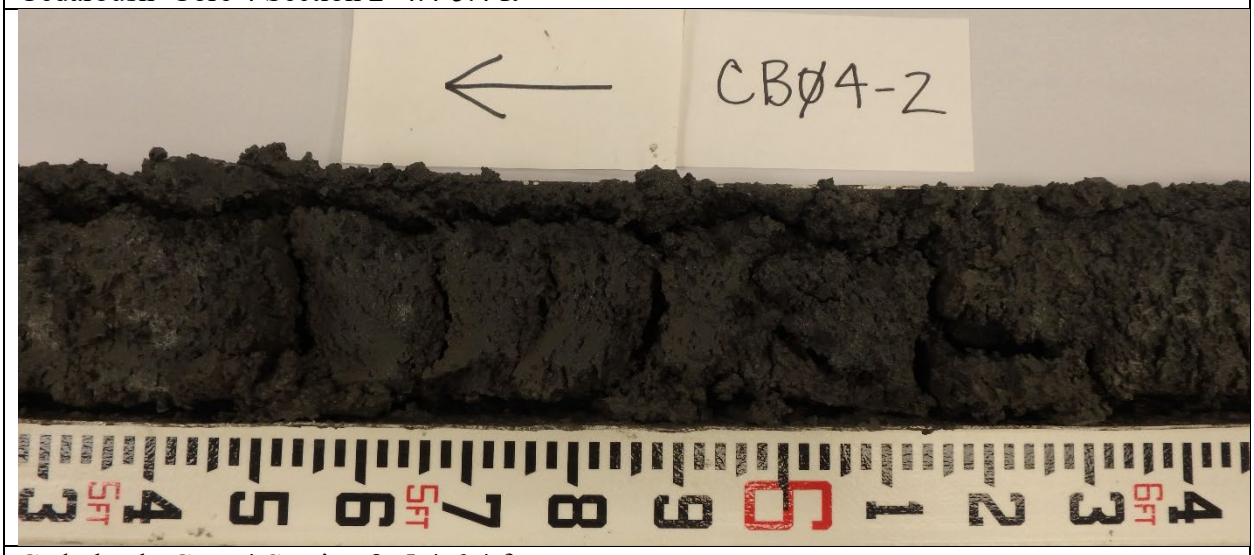
Cedarbush Core 4 Section 1 3-4 ft



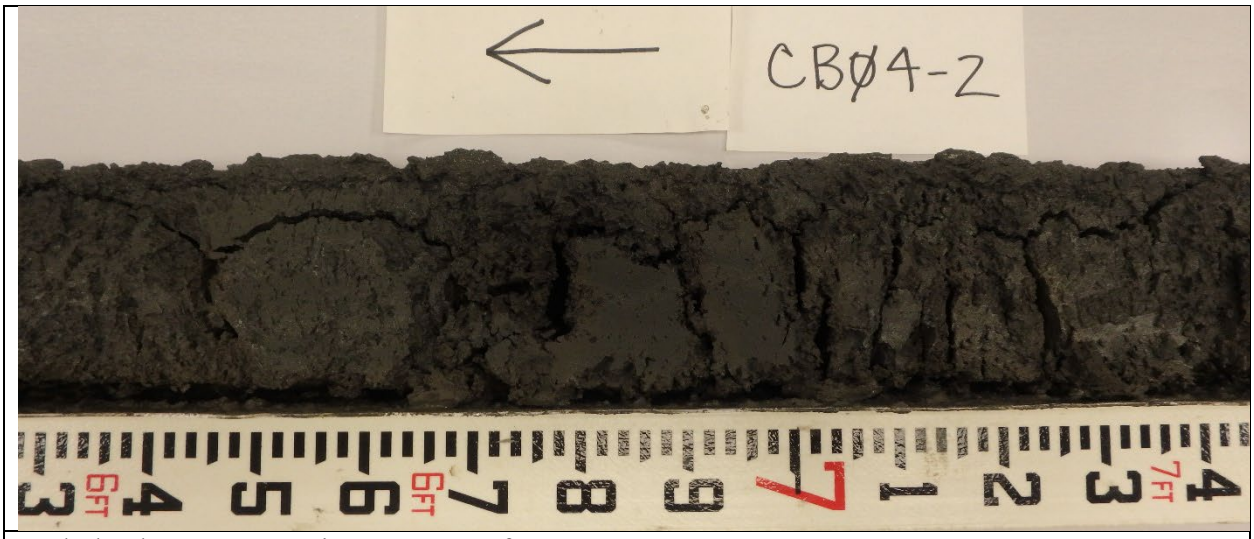
Cedarbush Core 4 Section 1 3.6-4.4 ft



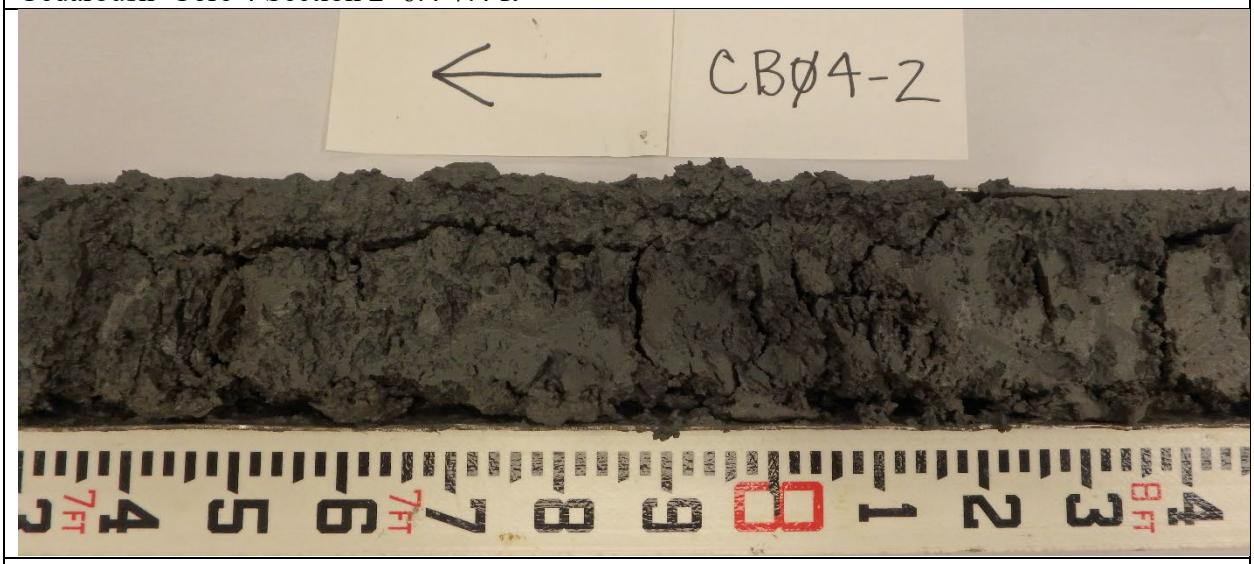
Cedarbush Core 4 Section 2 4.4-5.4 ft



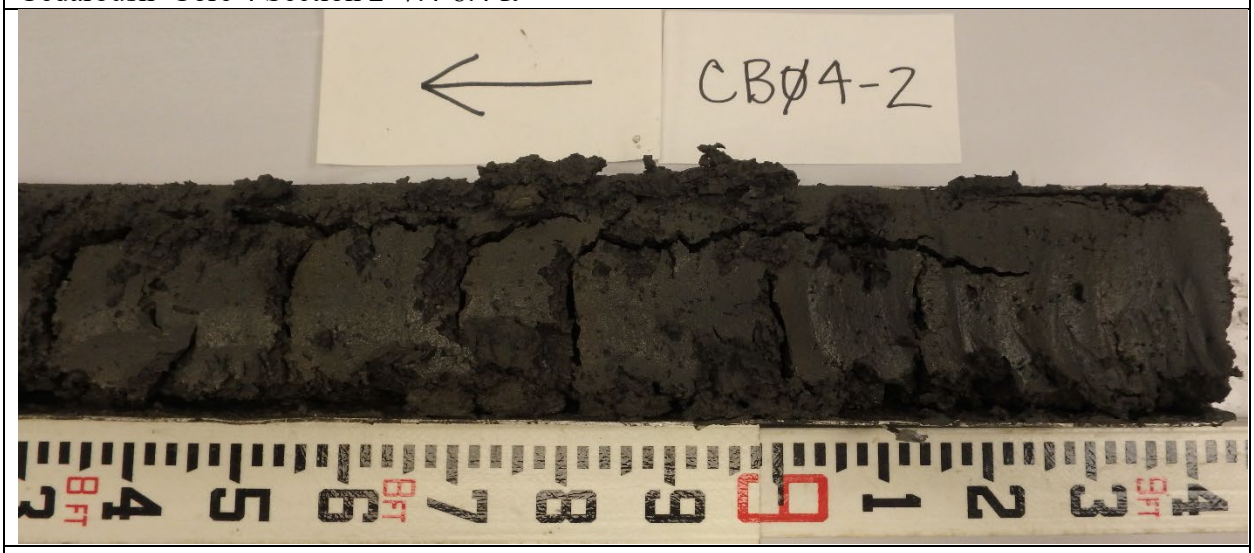
Cedarbush Core 4 Section 2 5.4-6.4 ft



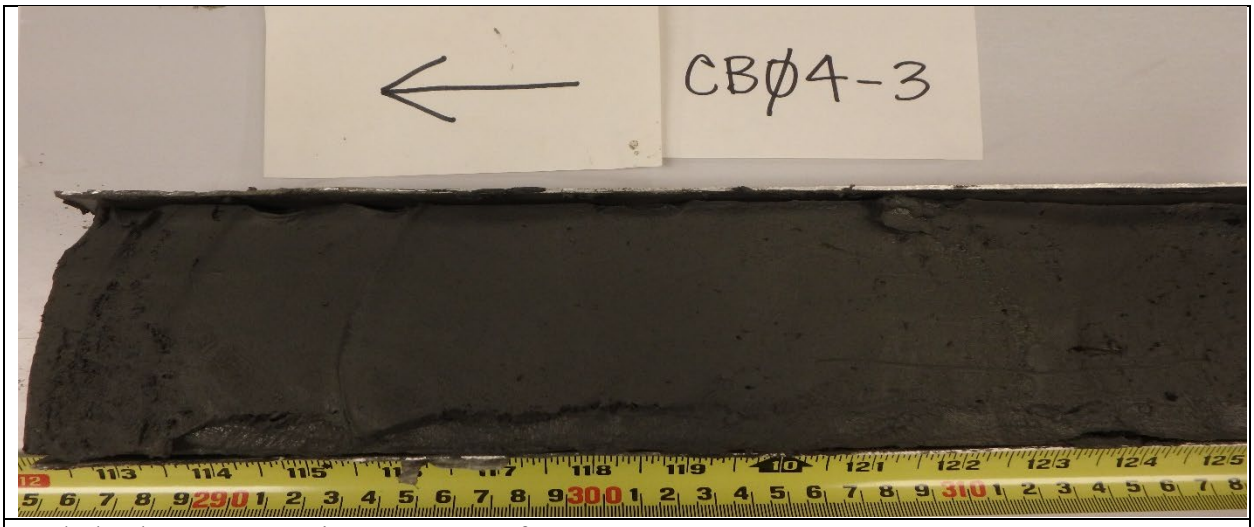
Cedarbush Core 4 Section 2 6.4-7.4 ft



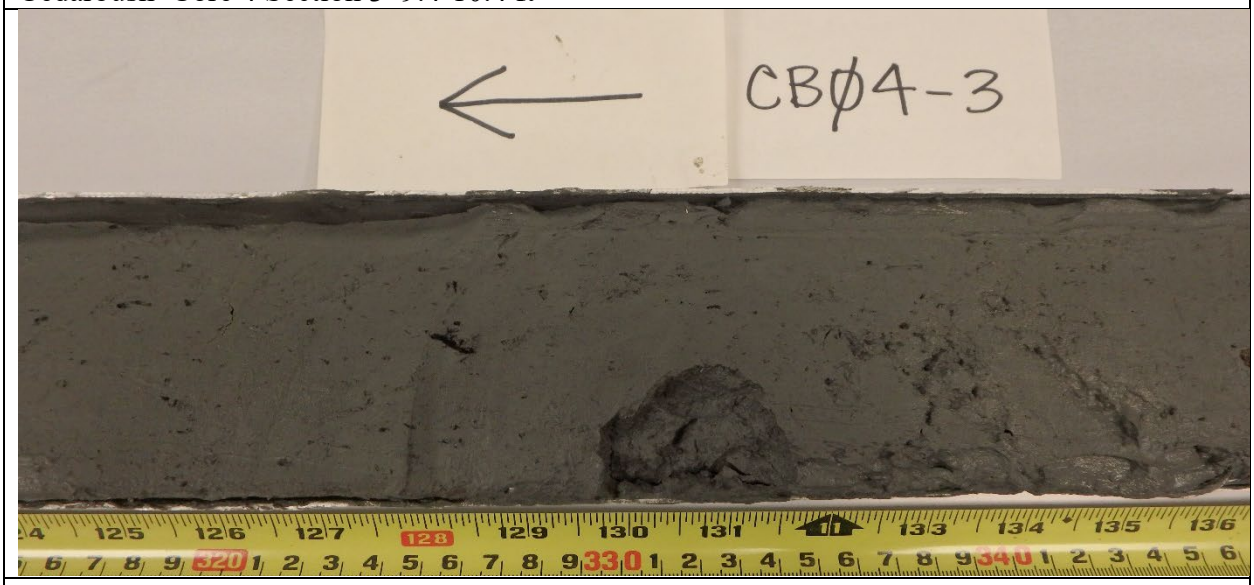
Cedarbush Core 4 Section 2 7.4-8.4 ft



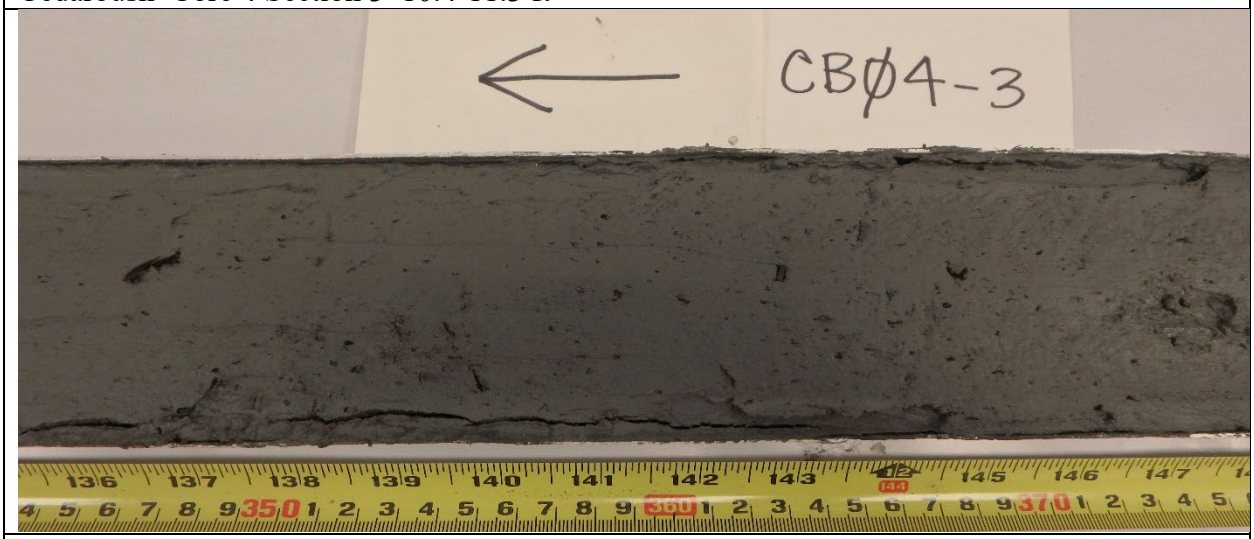
Cedarbush Core 4 Section 2 8.4-9.4 ft



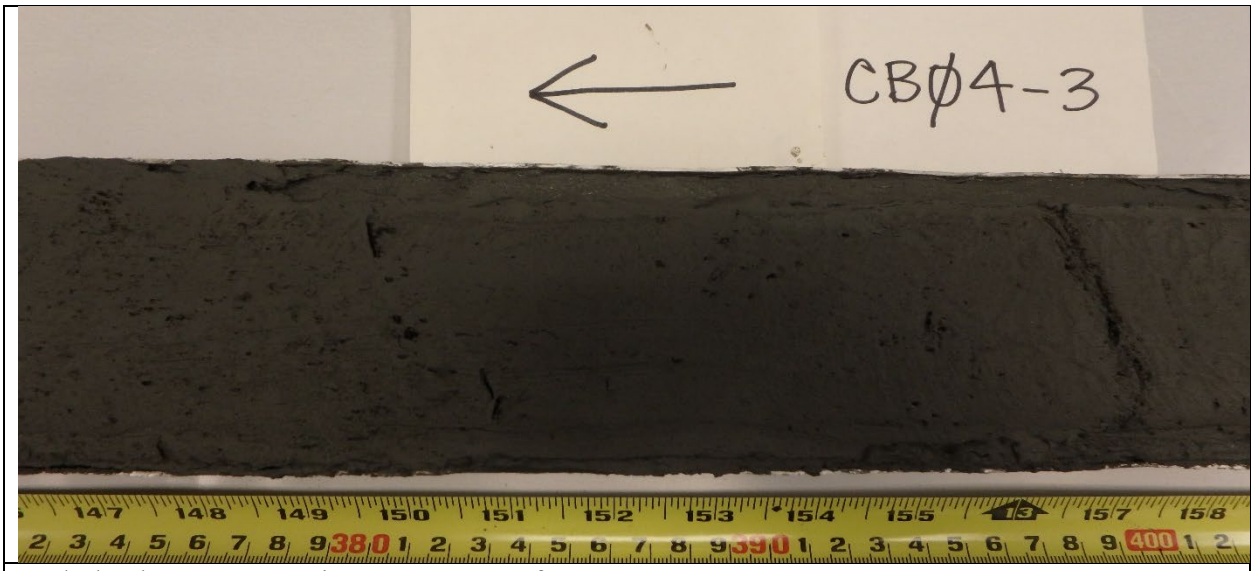
Cedarbush Core 4 Section 3 9.4-10.4 ft



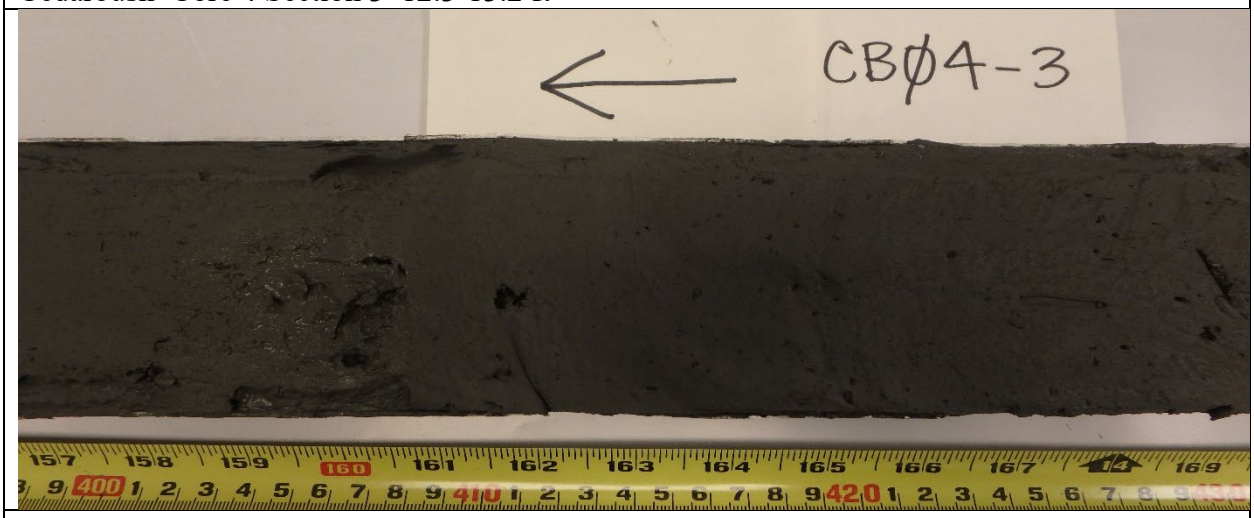
Cedarbush Core 4 Section 3 10.4-11.3 ft



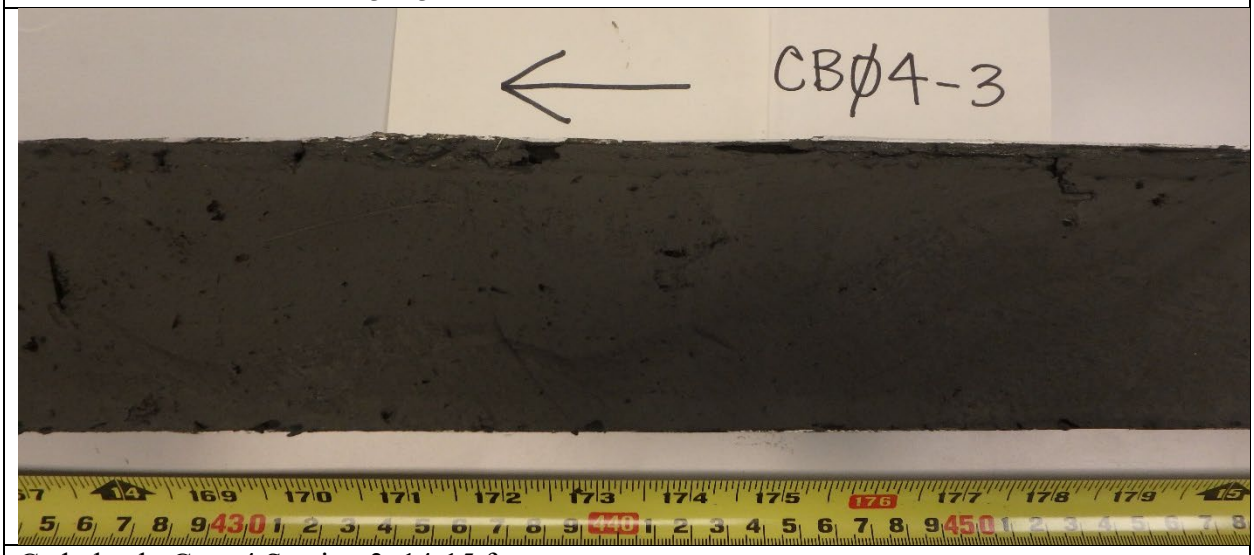
Cedarbush Core 4 Section 3 11.3-12.3 ft



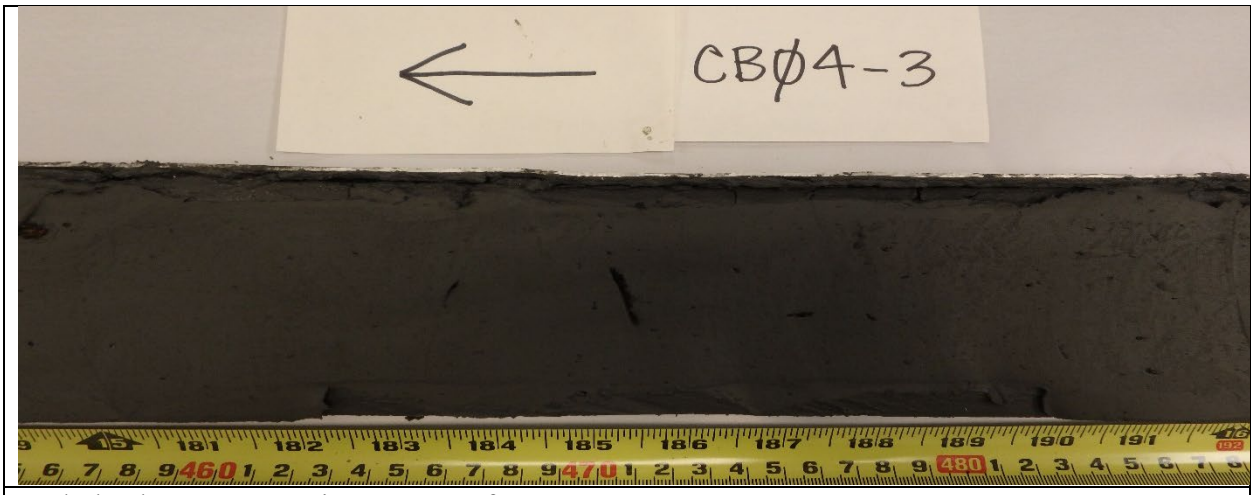
Cedarbush Core 4 Section 3 12.3-13.2 ft



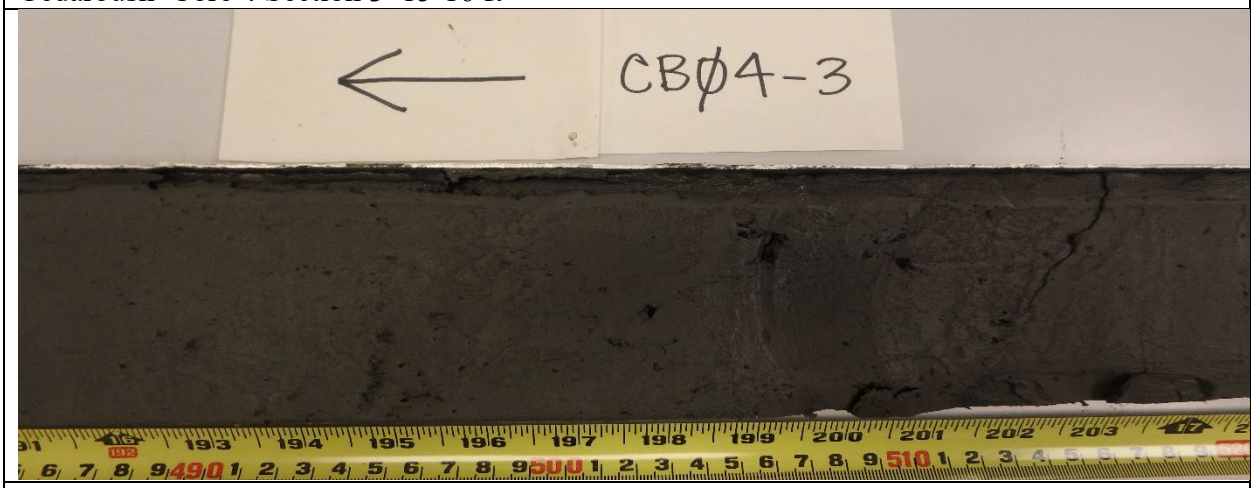
Cedarbush Core 4 Section 3 13.1-14.1 ft



Cedarbush Core 4 Section 3 14-15 ft



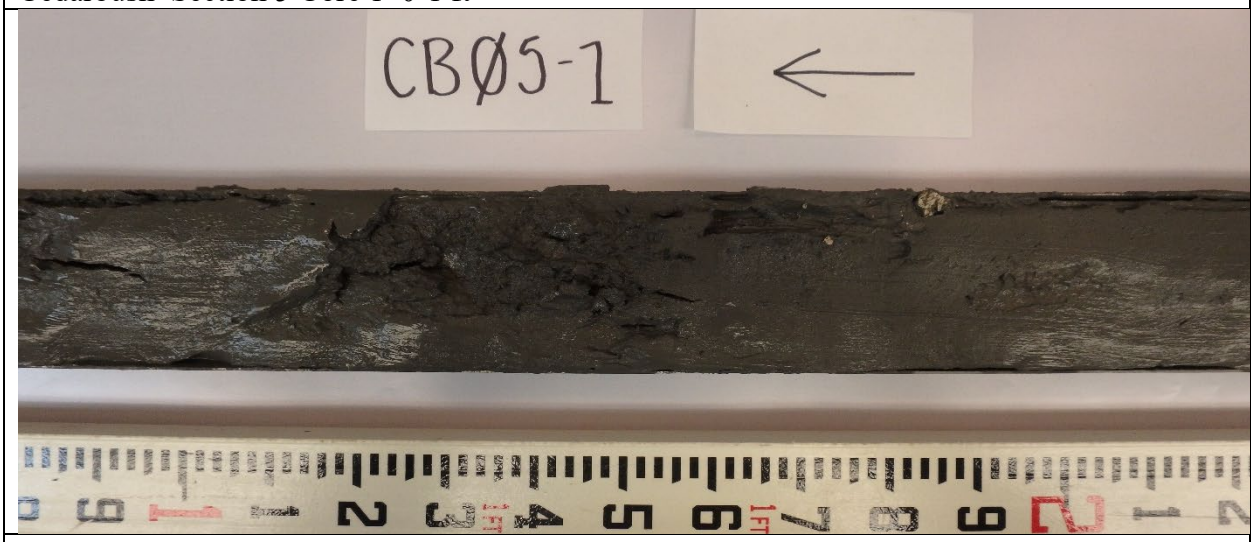
Cedarbush Core 4 Section 3 15-16 ft



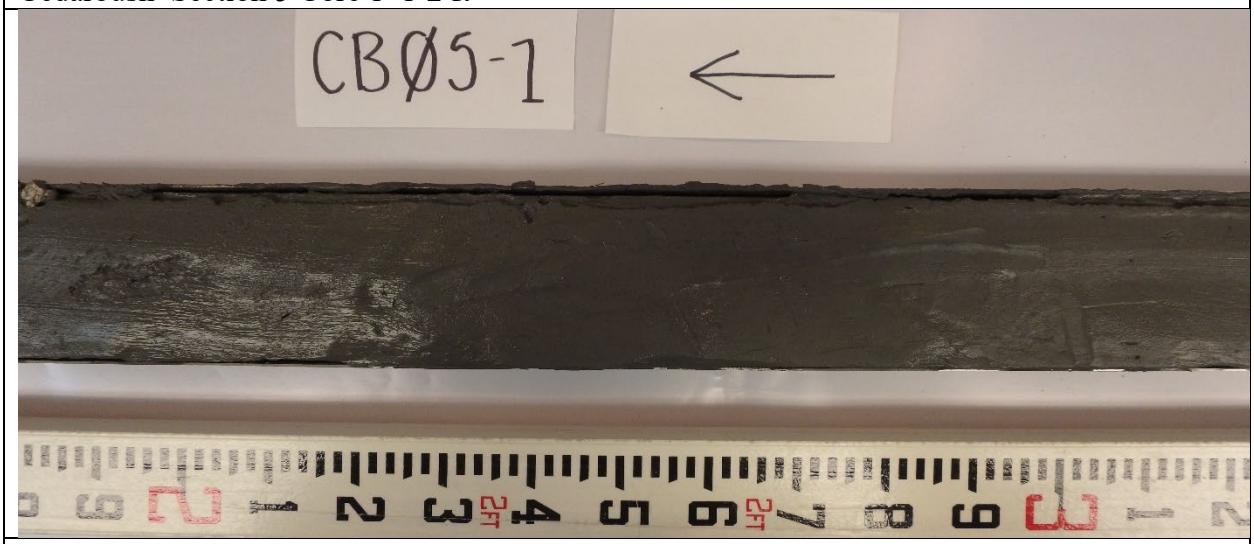
Cedarbush Core 4 Section 3 16-17 ft

Cedarbush Core 4 Section 3 16.4-17.5 ft

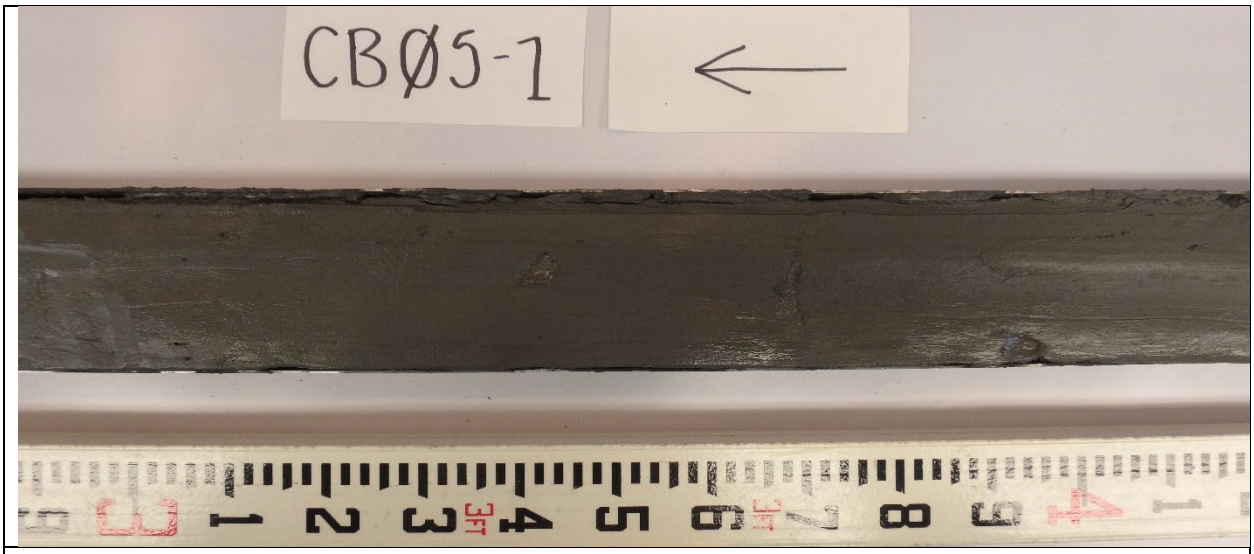
Cedarbush Section 5 Core 1 0-1 ft



Cedarbush Section 5 Core 1 1-2 ft

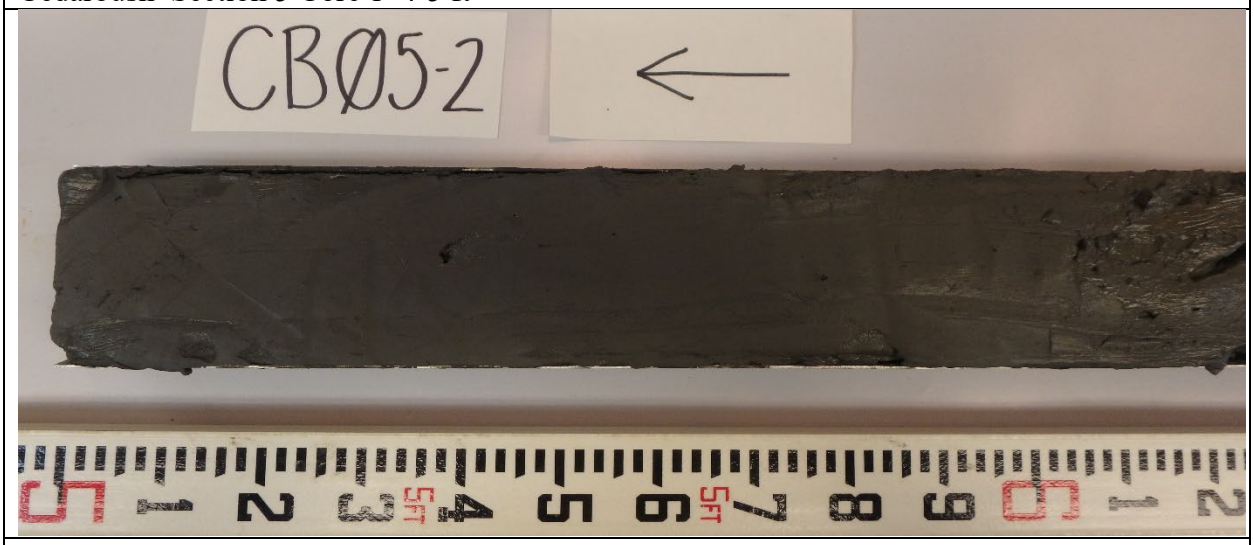


Cedarbush Section 5 Core 1 2-3 ft



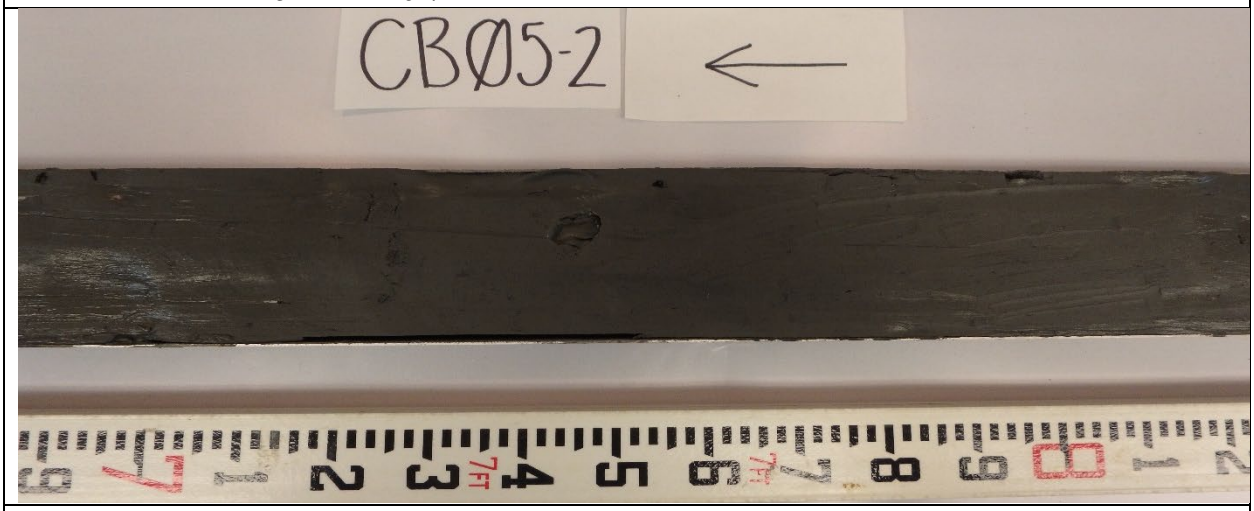
Cedarbush Section 5 Core 1 3-4 ft

Cedarbush Section 5 Core 1 4-5 ft

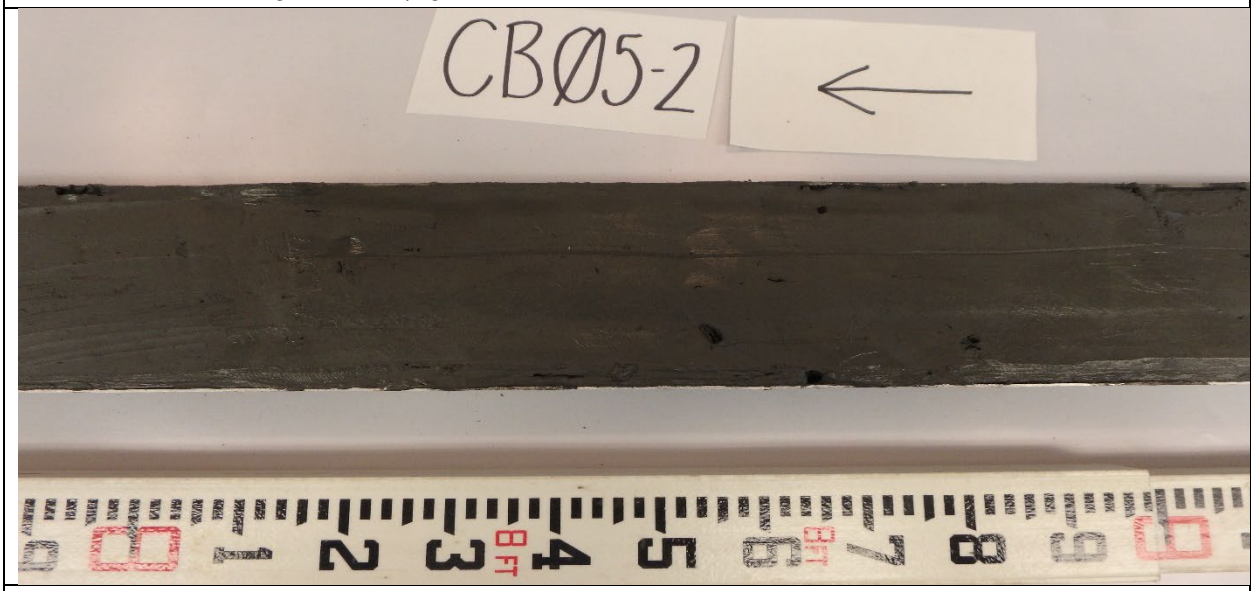


Cedarbush Section 5 Core 2 5-6 ft

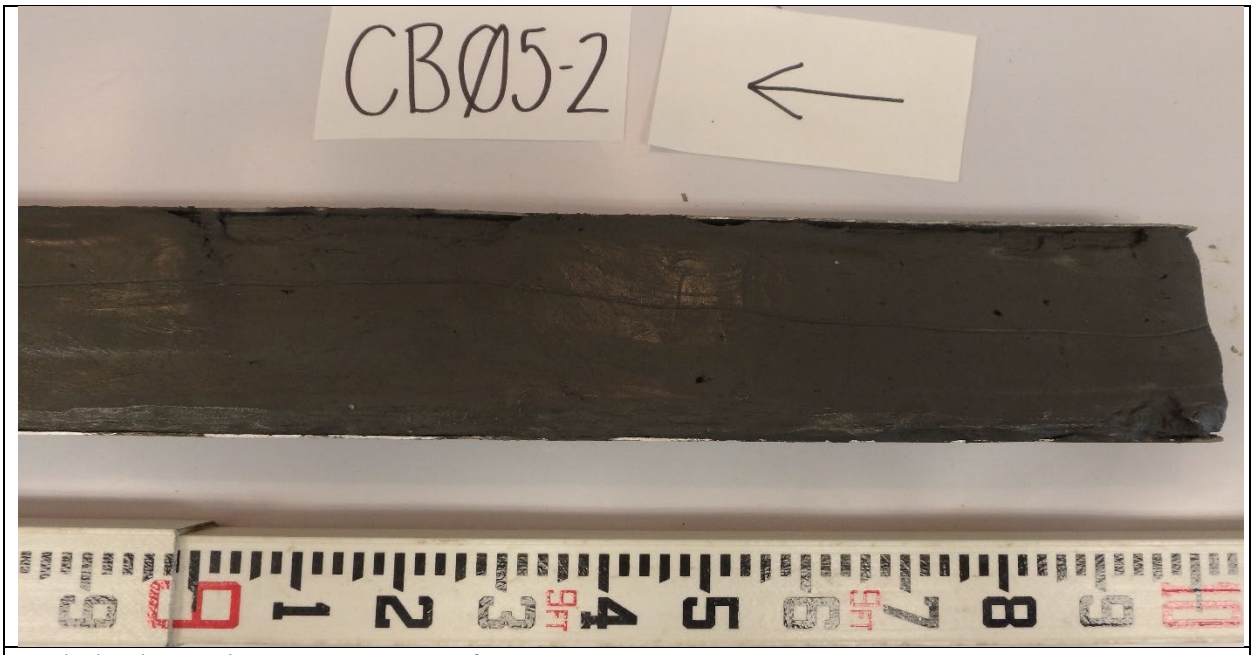
Cedarbush Section 5 Core 2 6-7 ft



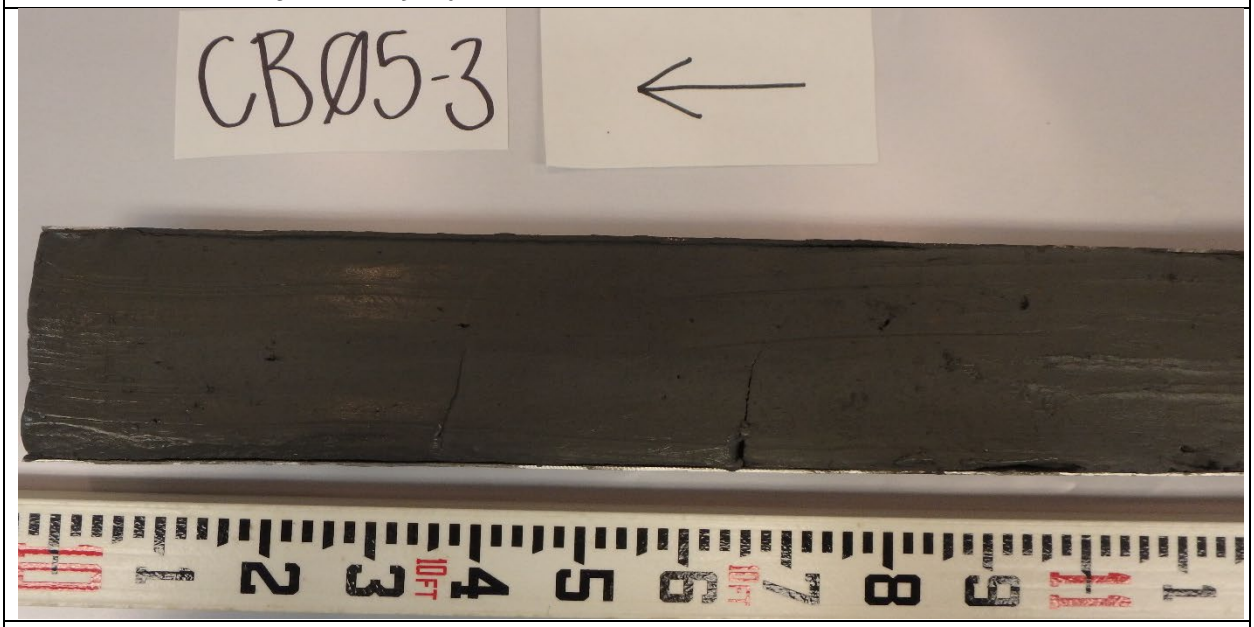
Cedarbush Section 5 Core 2 7-8 ft



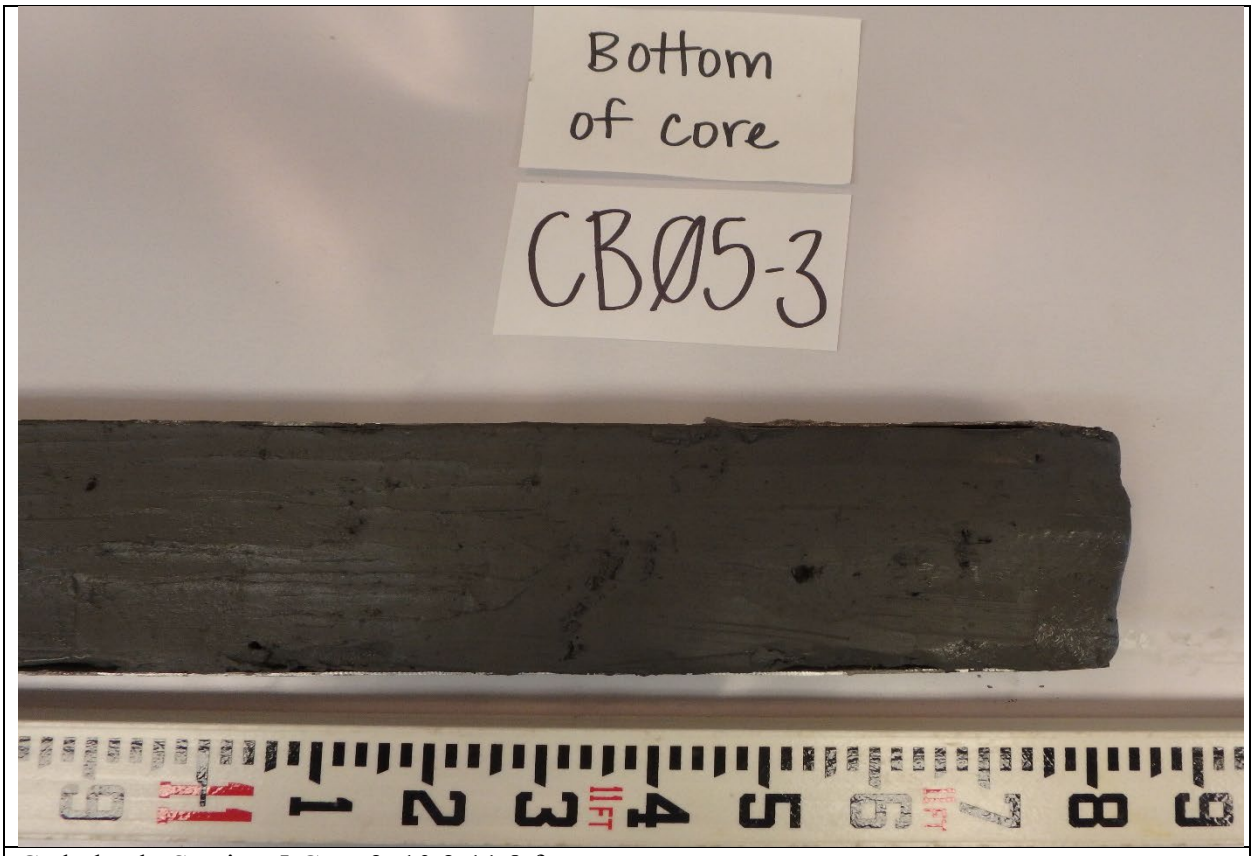
Cedarbush Section 5 Core 2 8-9 ft



Cedarbush Section 5 Core 2 9-10 ft

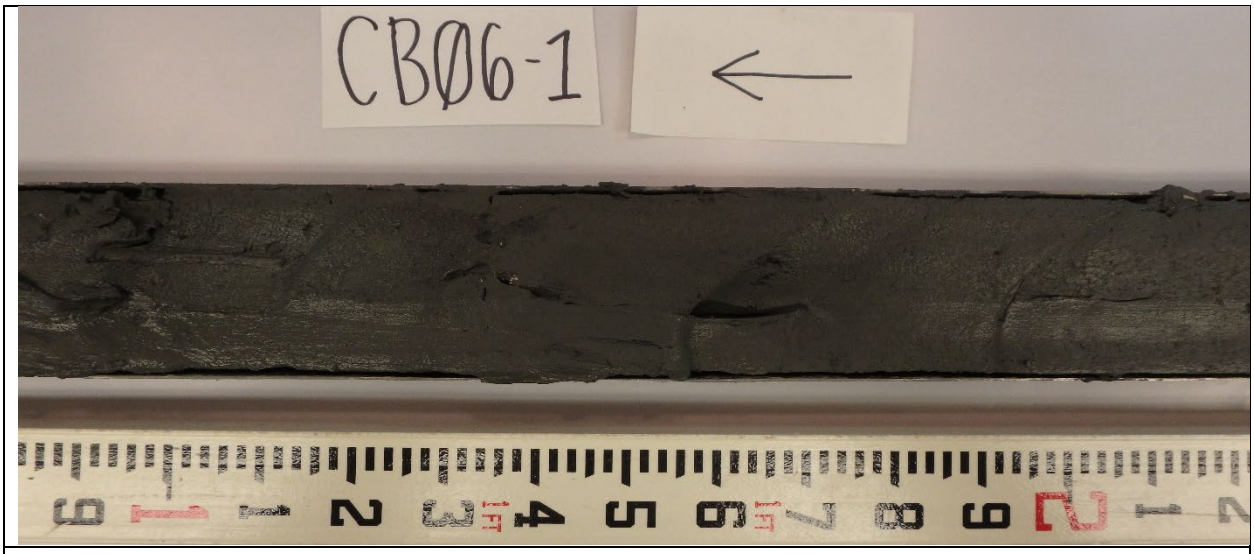


Cedarbush Section 5 Core 3 10-11 ft

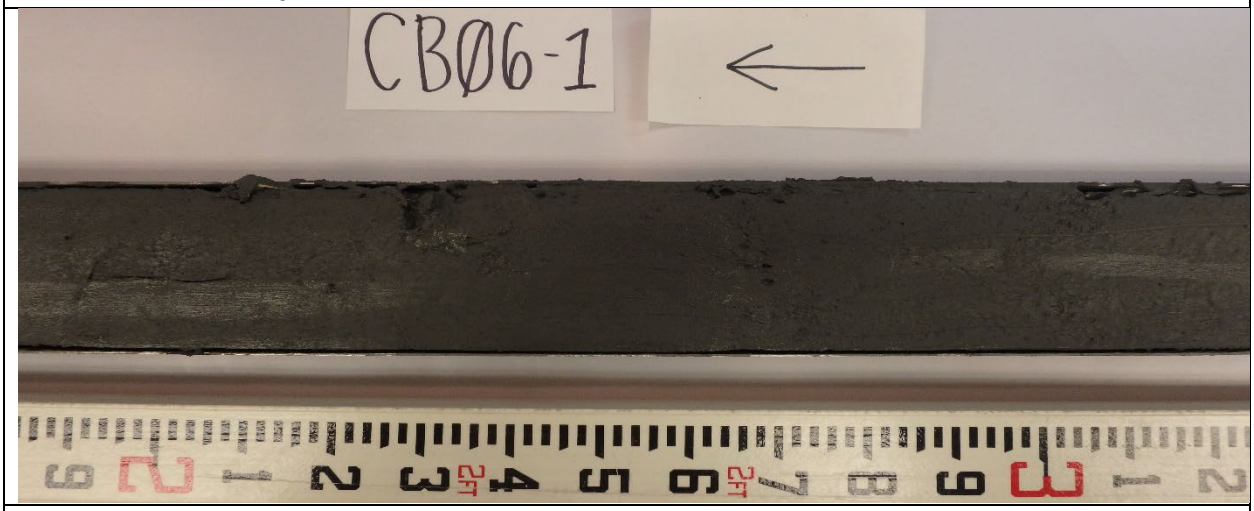


Cedarbush Section 5 Core 3 10.9-11.8 ft

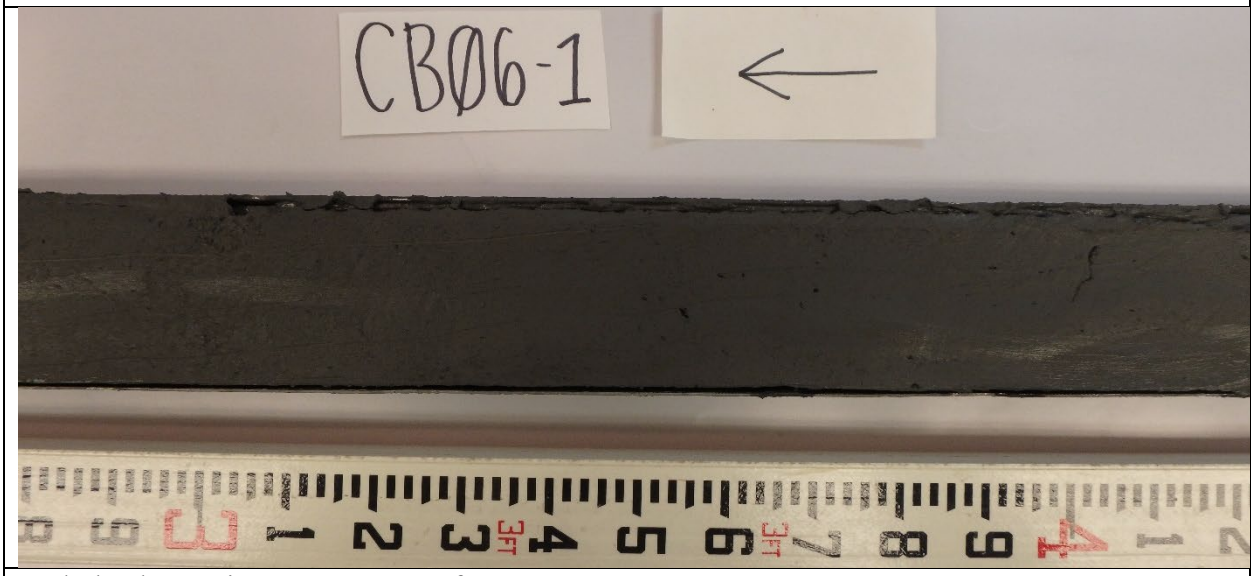
Cedarbush Section 6 Core 1 0-1 ft



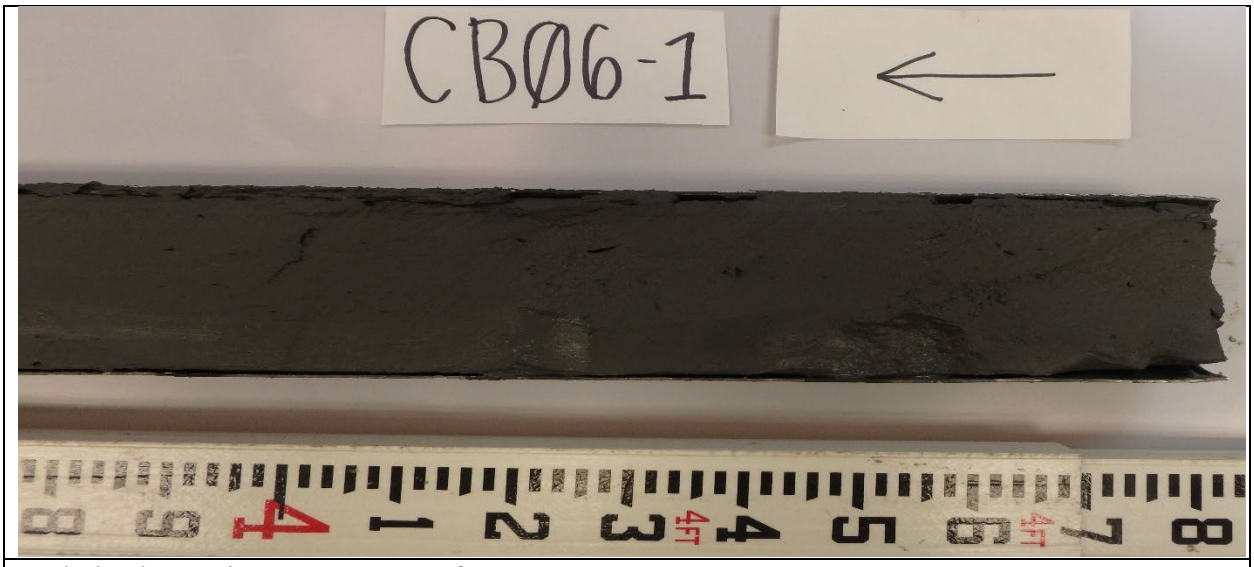
Cedarbush Section 6 Core 1 1-2 ft



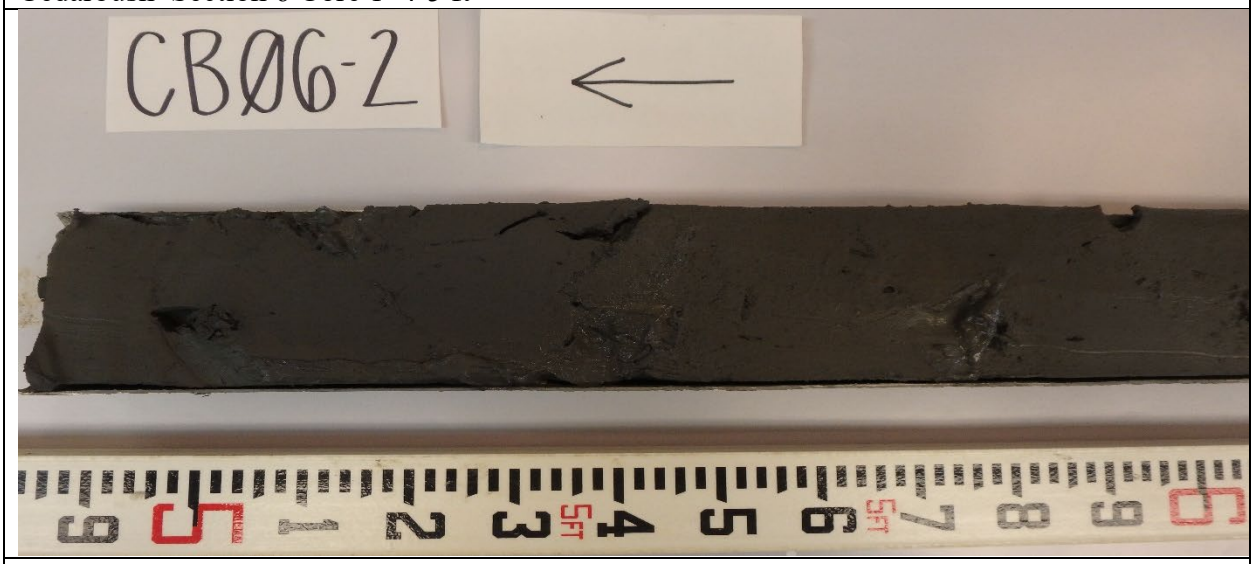
Cedarbush Section 6 Core 1 2-3 ft



Cedarbush Section 6 Core 1 3-4 ft

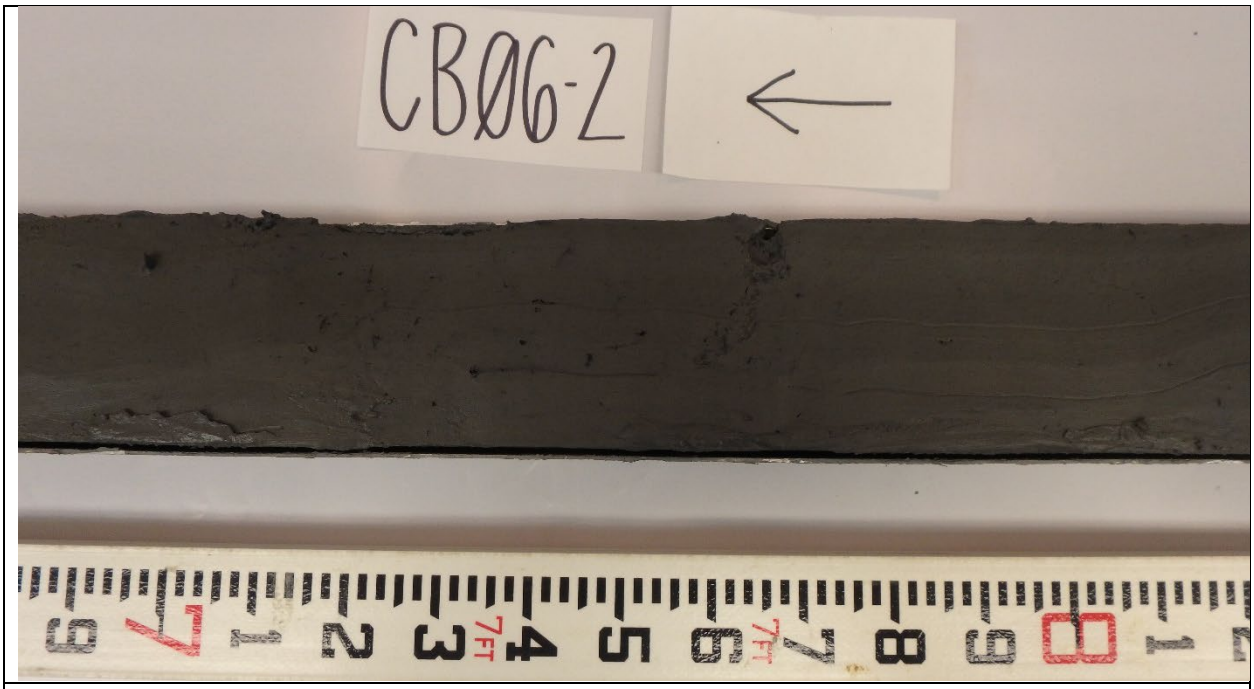


Cedarbush Section 6 Core 1 4-5 ft

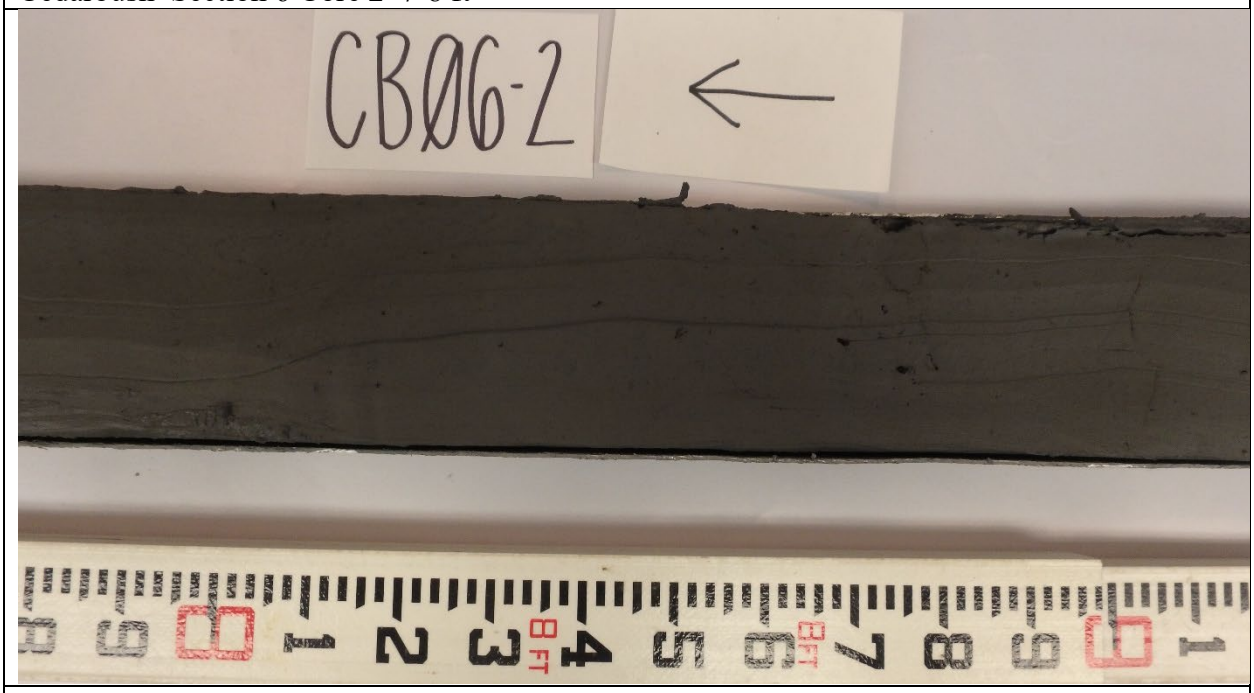


Cedarbush Section 6 Core 2 5-6 ft

Cedarbush Section 6 Core 2 6-7 ft



Cedarbush Section 6 Core 2 7-8 ft



Cedarbush Section 6 Core 2 8-9 ft

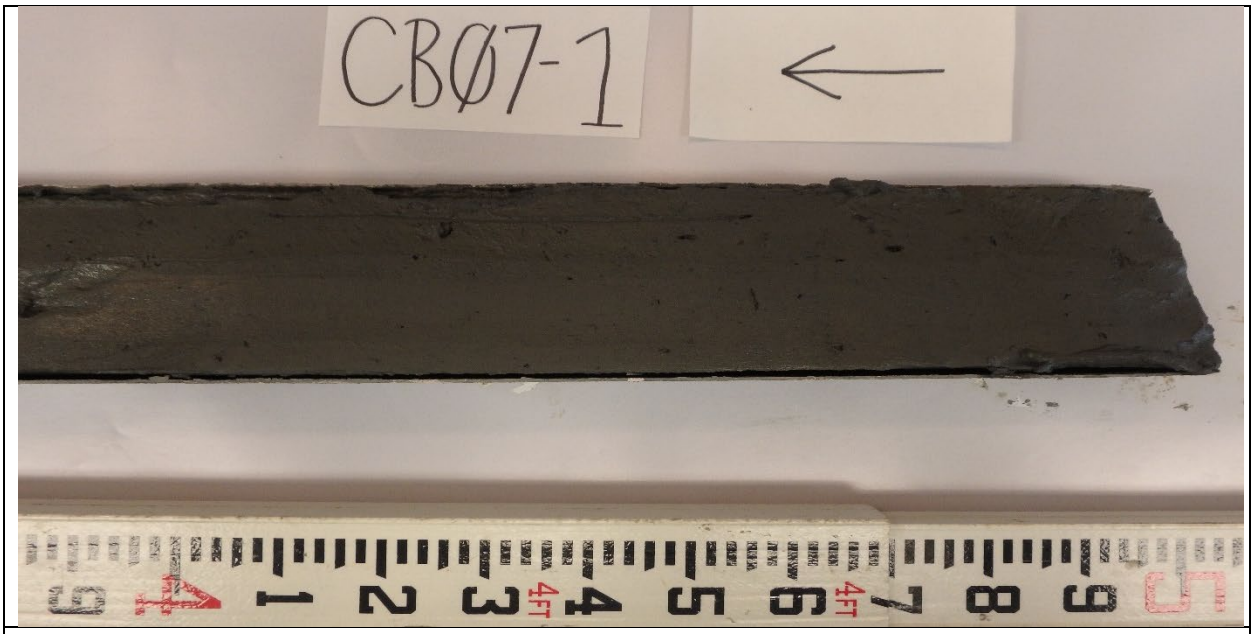
Cedarbush Section 6 Core 2 8.8-9.4 ft

Cedarbush Section 7 Core 1 0-1 ft

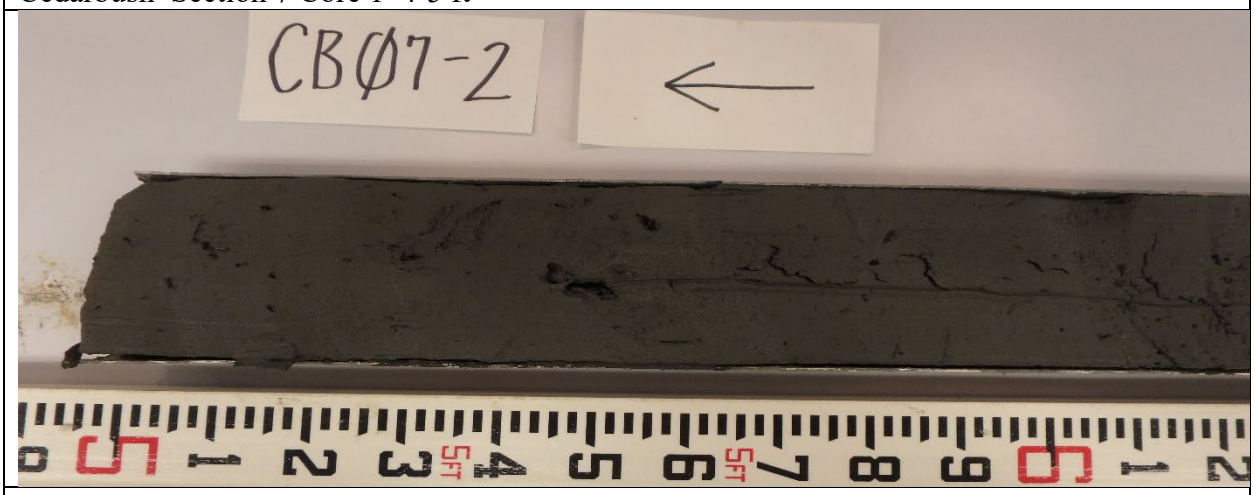
Cedarbush Section 7 Core 1 1-2 ft

Cedarbush Section 7 Core 1 2-3 ft

Cedarbush Section 7 Core 1 3-4 ft



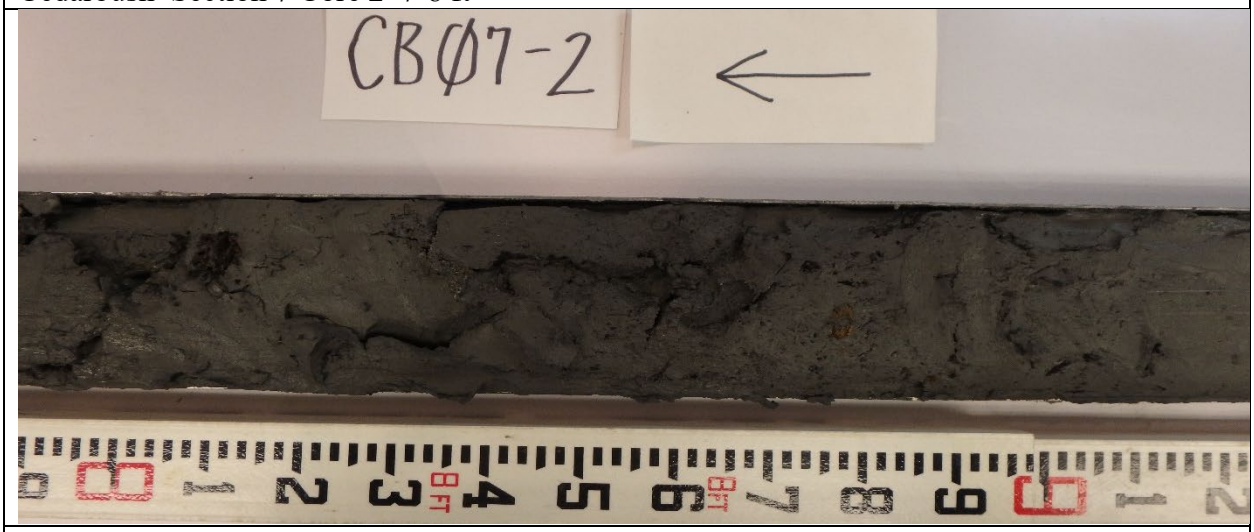
Cedarbush Section 7 Core 1 4-5 ft



Cedarbush Section 7 Core 2 5-6 ft

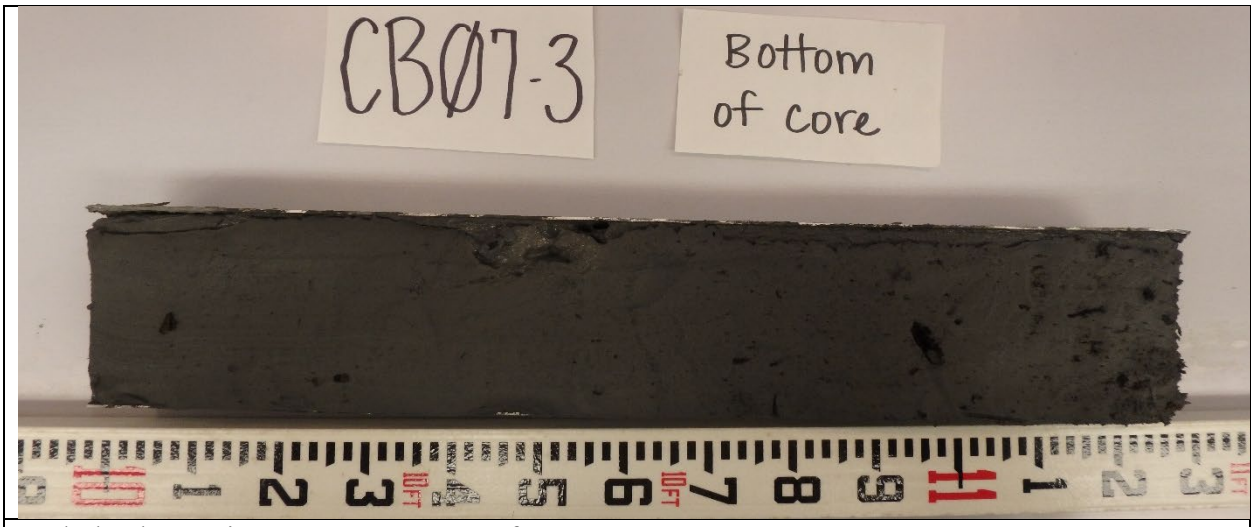
Cedarbush Section 7 Core 2 6-7 ft

Cedarbush Section 7 Core 2 7-8 ft



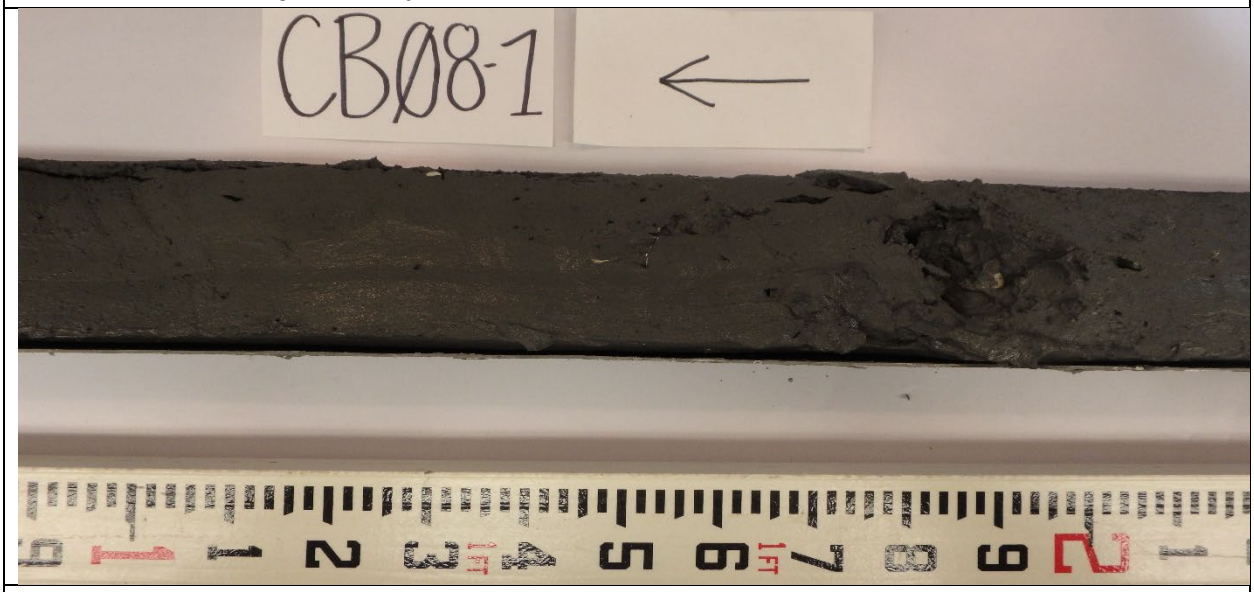
Cedarbush Section 7 Core 2 8-9 ft

Cedarbush Section 7 Core 2 9-10 ft

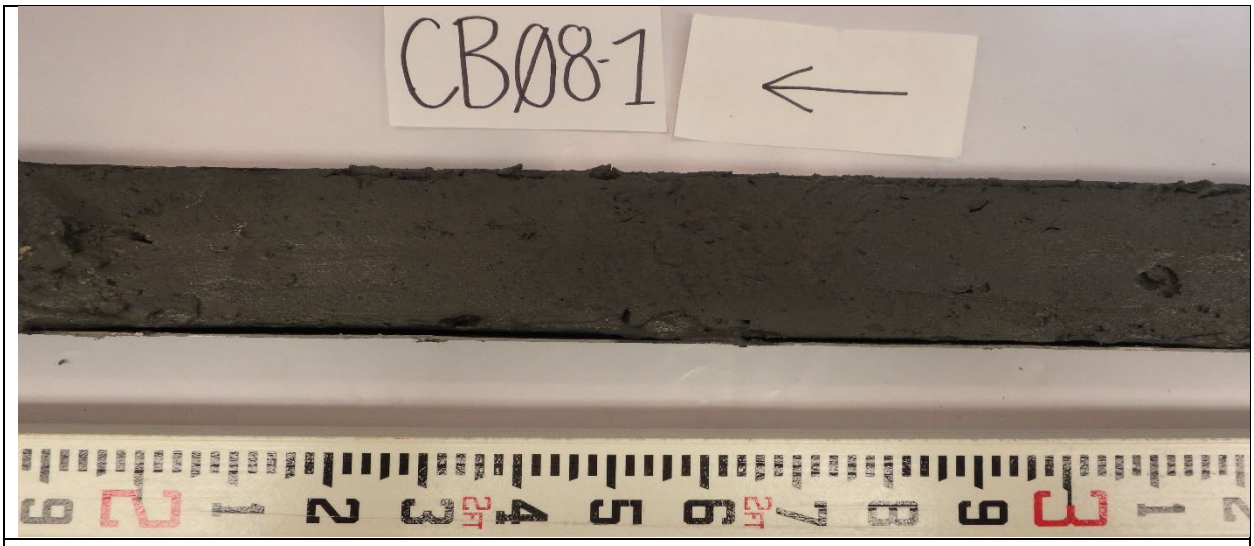


Cedarbush Section 7 Core 3 10-11.3 ft

Cedarbush Section 8 Core 1 0-1 ft



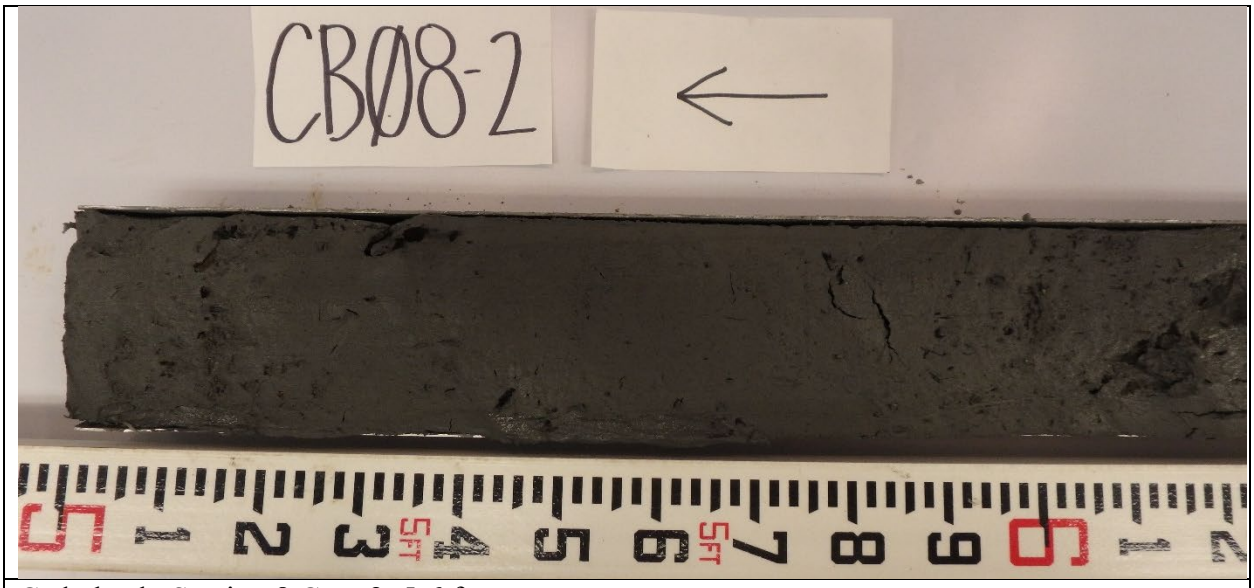
Cedarbush Section 8 Core 1 1-2 ft



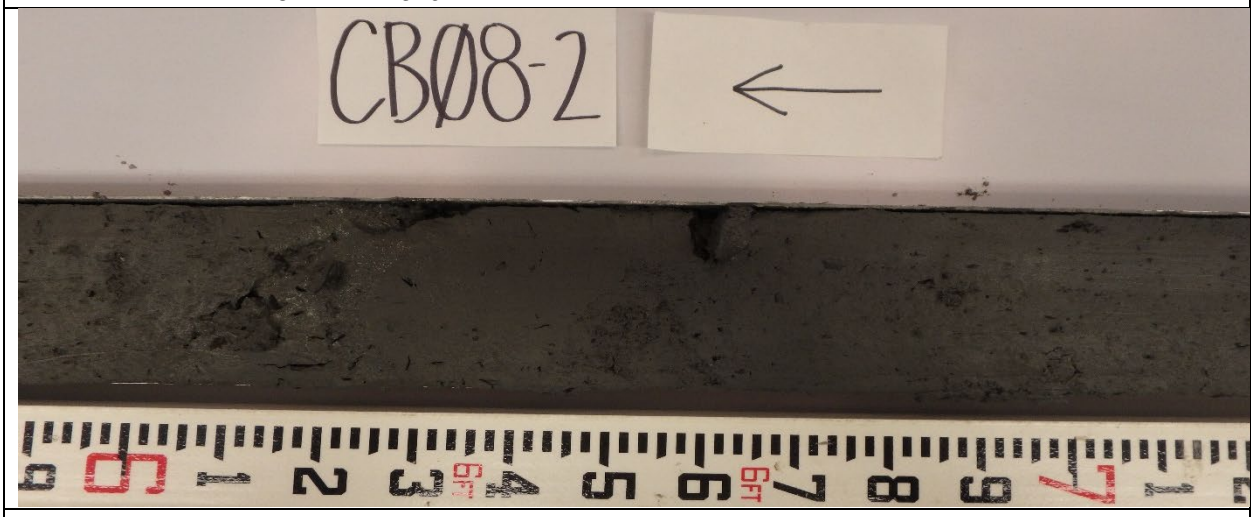
Cedarbush Section 8 Core 1 2-3 ft

Cedarbush Section 8 Core 1 3-4 ft

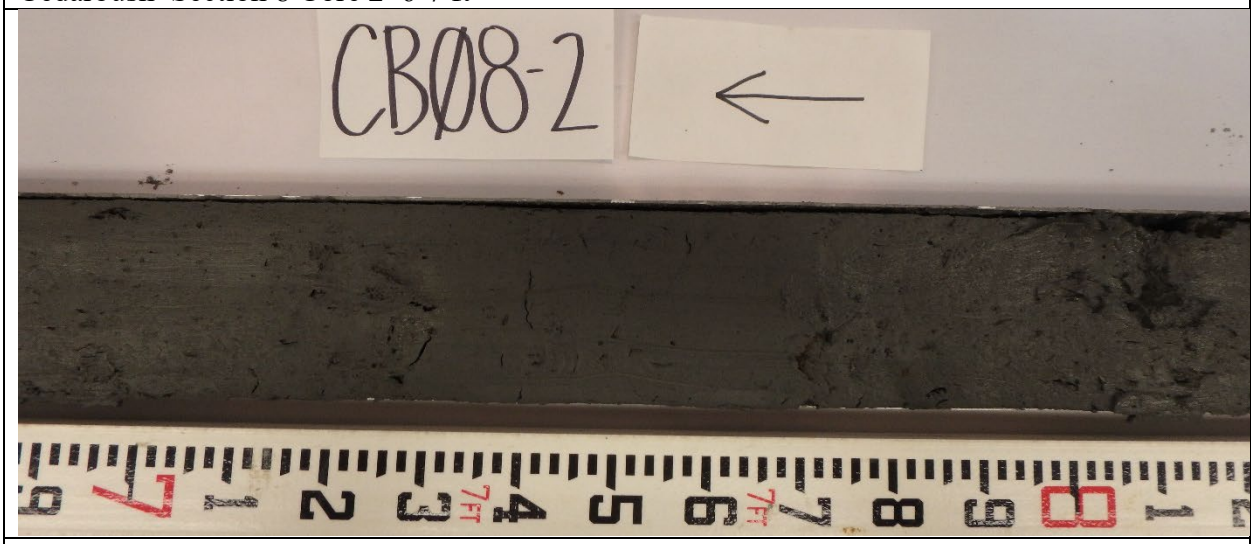
Cedarbush Section 8 Core 1 4-5 ft



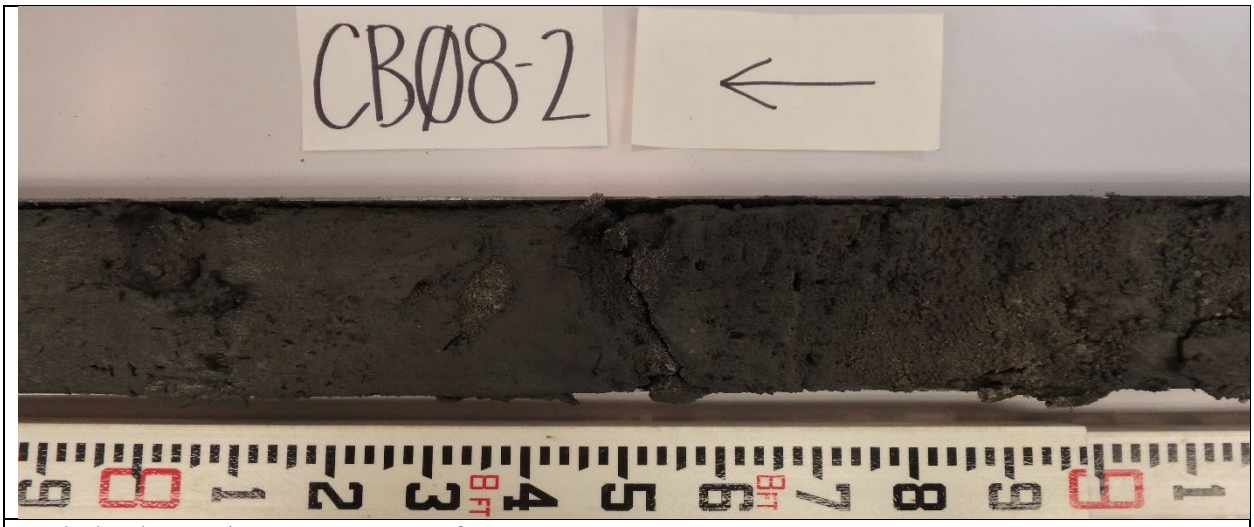
Cedarbush Section 8 Core 2 5-6 ft



Cedarbush Section 8 Core 2 6-7 ft

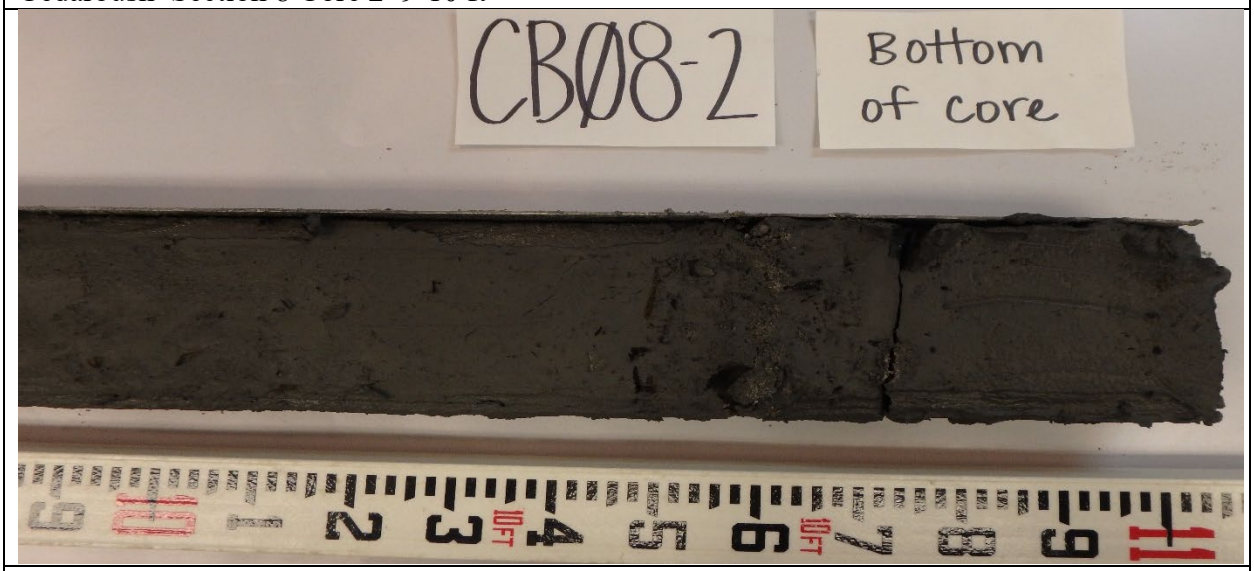


Cedarbush Section 8 Core 2 7-8 ft



Cedarbush Section 8 Core 2 8-9 ft

Cedarbush Section 8 Core 2 9-10 ft

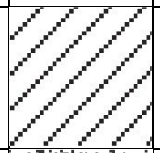
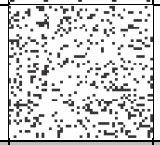
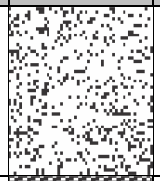
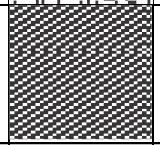
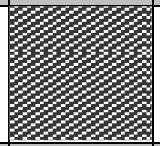


Cedarbush Section 8 Core 2 10-11 ft

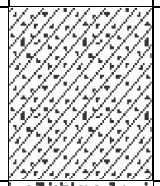
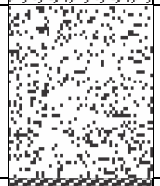
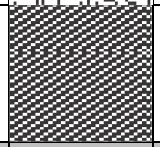
Appendix B

Core Logs

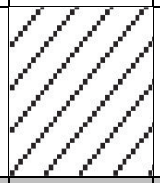
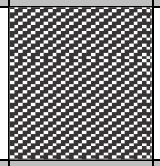
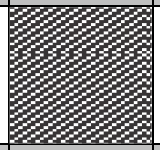
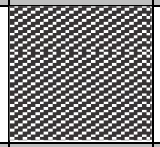
Cedarbush Core 1 Latitude: 37.3053 Longitude: -76.5703 Date: 10/05/2020

Section	Depth (ft)	Depth Below Sediment Surface MLLW (ft)	Graphic	USCS Soil Type	Description	Color	Grain Size %G/SD/S/C %Fines/D_{50} (mm) %Moisture
1	0-3.3	-7.4 to -10.7		**CL**	Silty clay with little fine sand, clay is lean (soft), micaceous, top 0.3 ft is shell hash with intermittent shells down core, sand content increases down core.	Olive gray	0/51.7/21.5/26.8/ 48.3/0.1 38.6
1	3.3-5	-10.7 to -12.4		**SW**	Fine to coarse sand with little granules and pebbles and little clay, poorly sorted, micaceous, heavy minerals, subangular, sand coarsens down core.	Light gray	3.1/93.2/0.6/3.1 3.7/0.3 15.3
1	5				**End of Section 1**		
2	5-8.5	-12.4 to -15.9		**SW**	Fine to coarse sand with little granules and pebbles, poorly sorted, 2 inch band of clay at 8.26 ft (very stiff and yellowish orange), sand is micaceous, subangular, with heavy minerals.	Light gray	9.7/84.8/1.1/4.4 5.5/0.4 11.2
2	8.5-10	-15.9 to -17.4		**CH**	Clay with trace fine sand, very stiff (high plasticity), micaceous, some organics throughout.	Dark gray	0/8.7/33.5/57.8 91.3/0 36.7
2	10				**End of Section 2**		
3	10-12.5	-17.4 to -19.9		**CH**	Clay, micaceous, very stiff (high plasticity), with some organic fragments throughout.	Dark gray	0/5.8/29.3/64.9 94.2/0 37.2
3	12.5				**End of Section 3**		
Core	12.5				**End of Core**		

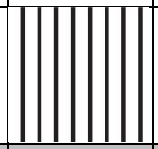
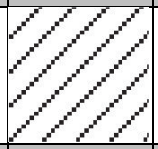
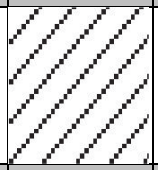
Cedarbush Core 2 Latitude: 37.3083 Longitude: -76.5667 Date: 10/05/2020

Section	Depth (ft)	Depth Below Sediment Surface MLLW (ft)	Graphic	USCS Soil Type	Description	Color	Grain Size %G/SD/S/C %Fines/D_{50} (mm) %Moisture
1	0-1.1	-5.4 to -6.5		**SC**	Clay and fine sand with little granules, poorly sorted, clay is soft (low to medium plasticity), sand is subangular, micaceous, heavy minerals, intermittent shell hash throughout section.	Dark gray	0/75.9/10.8/13.3 24.1/0.2 23.0
1	1.1-4.7	-6.5 to -10.1		**SW**	Fine to very coarse sand with some pebbles (≤ 20 mm) and granules, larger grains are angular to subangular with more rounded fine to medium sand, heavy minerals, micaceous.	Transitions between light gray and yellowish orange	6.7/91.9/0.2/1.2 1.4/0.4 12.4
1	4.7-5	-10.1 to -10.4		**CH**	Clay with little fine sand, clay is stiff (high plasticity), organic fragments throughout.	Light brown with 1mm bands of light gray	0/53.7/10.3/36.0 46.3/0.1 21.9
1	5				**End of Section 1**		
Core	5				**End of Core**		

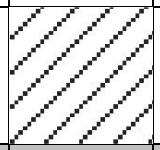
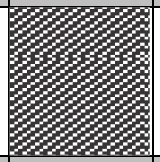
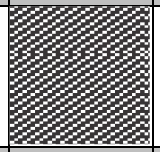
Cedarbush Core 3 Latitude: 37.3108 Longitude: -76.5636 Date: 10/05/2020

Section	Depth (ft)	Depth Below Sediment Surface MLLW (ft)	Graphic	USCS Soil Type	Description	Color	Grain Size %G/SD/S/C %Fines/D_{50} (mm) %Moisture
1	0-5	-4.4 to -9.4		**CL**	Clay, low plasticity (soft), micaceous, at 2.48-3.94 ft there are alternating bands (~1 in) of sandy clay and clay, heavy minerals, intermittent shell hash (1-40 mm) throughout.	Dark gray	0/37.2/24.9/37.9 62.8/0 38.2
1	5				**End of Section 1**		
2	5-10	-9.4 to -14.4		**CH**	Clay, medium stiff transitioning to stiff (medium plasticity), from 6.78 to 8.02 ft there are alternating bands (~2 cm) of sandy clay and clay, micaceous, heavy minerals.	Dark gray	0/31.5/29.0/39.5 68.5/0 40.4
2	10				**End of Section 2**		
3	10-15	-14.4 to -19.4		**CH**	Clay, medium stiff to very stiff (high plasticity), at 12 ft there is one fully articulated shell (75 mm), with trace organic fragments.	Dark gray	0/7.9/42.3/49.8 92.1/0 41.2
3	15				**End of Section 3**		
4	15-18.4	-19.4 to -22.8		**CH**	Clay, stiff (high plasticity), with trace organic fragments.	Dark gray	0/9.6/41.6/48.8 90.4/0 35.3
4	18.4				**End of Section 4**		
Core	18.4				**End of Core**		

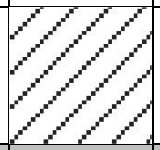
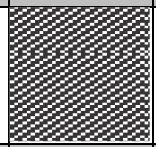
Cedarbush Core 4 Latitude: 37.3091 Longitude: -76.5591 Date: 10/05/2020

Section	Depth (ft)	Depth Below Sediment Surface MLLW (ft)	Graphic	USCS Soil Type	Description	Color	Grain Size %G/SD/S/C %Fines/D_{50} (mm) %Moisture
1	0-4.4	-2.1 to -6.5		**ML**	clayey silt, low plasticity, some shells/shell fragments throughout	Dark gray	0/27.4/27.3/45.3 72.6/0 42.9
1	4.4				**End of Section 1**		
2	4.4-9.4	-6.5 to -11.5		**CL**	silty clay with little fine sand, clay content increases down core, low plasticity, rare shells (clam)	Olive gray	0/10.6/38.9/50.5 89.4/0 41.8
2	9.4				**End of Section 2**		
3	9.4-17.4	-11.5 to -19.5		**CL**	silty clay, trace fine sand, low plasticity, clay content increases down core, micaceous, woody/plant fragments throughout entire section	Olive gray	0/9.0/42.1/48.9 91.0/0 43.1
3	17.4				**End of Section 3**		
Core	17.4				**End of Core**		

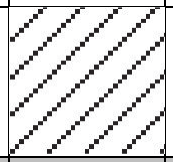
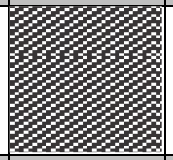
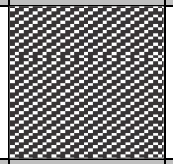
Cedarbush Core 5 Latitude: 37.3106 Longitude: -76.5565 Date: 10/05/2020

Section	Depth (ft)	Depth Below Sediment Surface MLLW (ft)	Graphic	USCS Soil Type	Description	Color	Grain Size %G/SD/S/C %Fines/D_{50} (mm) %Moisture
1	0-5	-2.2 to -7.2		**CL**	Clay, soft (low plasticity), with little shell fragments, micaceous.	Dark gray	0/4.5/42.1/53.4 95.5/0 50.1
1	5				**End of Section 1**		
2	5-10	-7.2 to -12.2		**CH**	Clay, medium stiff with one 11 cm band at 6.06 ft of very soft clay, micaceous, with trace 2 mm bands of fine to medium sand, heavy minerals.	Dark gray	0/8.0/41.3/50.7 92.0/0 41.2
2	10				**End of Section 2**		
3	10-11.8	-12.2 to -14.0		**CH**	Clay, stiff (high plasticity) with trace 1mm bands of fine to medium sand, heavy minerals, micaceous.	Dark gray	0/12.4/36.6/51.0 87.6/0 37.4
3	11.8				**End of Section 3**		
Core	11.8				**End of Core**		

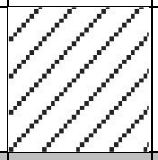
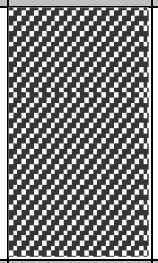
Cedarbush Core 6 Latitude: 37.3105 Longitude: -76.5542 Date: 10/05/2020

Section	Depth (ft)	Depth Below Sediment Surface MLLW (ft)	Graphic	USCS Soil Type	Description	Color	Grain Size %G/SD/S/C %Fines/D_{50} (mm) %Moisture
1	0-5	-2.6 to -7.6		**CL**	Clay, soft (low plasticity), with trace shell and organic fragments, micaceous.	Dark gray	0/5.5/40.8/53.7 94.5/0 51.2
1	5				**End of Section 1**		
2	5-9.4	-7.6 to -12		**CH**	Clay, medium stiff with little organic fragments, micaceous.	Dark gray	0/1.0/39.6/59.4 99.0/0 44.4
2	9.4				**End of Section 2**		
Core	9.4				**End of Core**		

Cedarbush Core 7 Latitude: 37.3119 Longitude: -76.5505 Date: 10/05/2020

Section	Depth (ft)	Depth Below Sediment Surface MLLW (ft)	Graphic	USCS Soil Type	Description	Color	Grain Size %G/SD/S/C %Fines/D_{50} (mm) %Moisture
1	0-5	-2.9 to -7.9		**CL**	Clay, soft (low plasticity) but stiffens down core, shell fragments and articulated shells (≤ 10 cm) present from 0-1.86 ft, micaceous.	Dark gray	0/19.5/33.1/47.4 80.5/0 48.1
1	5				**End of Section 1**		
2	5-10	-7.9 to -12.9		**CH**	Clay, medium stiff with trace 1-3 mm bands of fine to medium sand, heavy minerals, with little organic fragments, micaceous.	Dark gray	0/12.8/41.1/46.1 87.2/0 42.9
2	10				**End of Section 2**		
3	10-11.3	-12.9 to -14.2		**CH**	Clay, medium stiff, from 11-11.26 ft some fine to medium sand, well sorted, subrounded, heavy minerals, with little organic fragments, micaceous.	Dark gray	0/24.8/32.7/42.5 75.2/0 39.5
3	11.3				**End of Section3**		
Core	11.3				**End of Core**		

Cedarbush Core 8 Latitude: 37.3105 Longitude: -76.5542 Date: 10/05/2020

Section	Depth (ft)	Depth Below Sediment Surface MLLW (ft)	Graphic	USCS Soil Type	Description	Color	Grain Size %G/SD/S/C %Fines/D_{50} (mm) %Moisture
1	0-5	-1.3 to -6.3		**CL**	Clay, soft (low plasticity) and stiffens down core, last 0.82 ft (4.18-5 ft) with little fine sand, with trace shell and organic fragments, micaceous.	Dark gray	0/17.3/36.6/46.1 82.7/0 46.4
1	5				**End of Section 1**		
2	5-11	-6.3 to -12.3		**CH**	Clay with little fine sand, clay is medium stiff with little organic fragments, intermitent 1-3 mm bands of fine to medium subrounded sand, heavy minerals, micaceous, well sorted, from 8.84-9.84 vertical band (2 cm wide) of coarse sand and granules and pebbles (≤ 3mm).	Dark gray	0/39.7/27.7/32.6 60.3/0 34.3
2	11				**End of Section 2**		
Core	11				**End of Core**		

Appendix C

Sediment Data

Name	Location	Core-Section	SampleID	% Moisture Units: % MDL: 0.1
CB01	Cedarbush Creek	1-1	1-1 (0-3.28 ft)	38.6
CB02	Cedarbush Creek	1-1	1-1 (3.28-5 ft)	15.3
CB03	Cedarbush Creek	1-2	1-2 (5-8.5 ft)	11.2
CB04	Cedarbush Creek	1-2	1-2 (8.5-10 ft)	36.7
CB05	Cedarbush Creek	1-3	1-3 (10-12.54 ft)	37.2
CB06	Cedarbush Creek	2-1	2-1 (0-1.12 ft)	23.0
CB07	Cedarbush Creek	2-1	2-1 (1.12-4.66 ft)	12.4
CB08	Cedarbush Creek	2-2	2-2 (4.66-5 ft)	21.9
CB09	Cedarbush Creek	3-1	3-1 (0-5 ft)	38.2
CB10	Cedarbush Creek	3-2	3-2 (5-10 ft)	40.4
CB11	Cedarbush Creek	3-3	3-3 (10-15 ft)	41.2
CB12	Cedarbush Creek	3-4	3-4 (15-18.42 ft)	35.3
CB23	Cedarbush Creek	4-1	4-1 (0-4.4 ft)	42.9
CB24	Cedarbush Creek	4-2	4-2 (4.4-9.4 ft)	41.8
CB25	Cedarbush Creek	4-3	4-3 (9.4-17.4 ft)	43.1
CB13	Cedarbush Creek	5-1	5-1 (0-5 ft)	50.1
CB14	Cedarbush Creek	5-2	5-2 (5-10 ft)	41.2
CB15	Cedarbush Creek	5-3	5-3 (10-11.84 ft)	37.4
CB16	Cedarbush Creek	6-1	6-1 (0-4.82 ft)	51.2
CB17	Cedarbush Creek	6-2	6-2 (4.82-9.38 ft)	44.4
CB18	Cedarbush Creek	7-1	7-1 (0-5 ft)	48.1
CB19	Cedarbush Creek	7-2	7-2 (5-10 ft)	42.9
CB20	Cedarbush Creek	7-3	7-3 (10-11.26 ft)	39.5
CB21	Cedarbush Creek	8-1	8-1 (0-5 ft)	46.4
CB22	Cedarbush Creek	8-2	8-2 (5-11 ft)	34.3

Name	SampleID	% Gravel Units: % MDL: 0.1	% Sand Units: % MDL: 0.1	% Silt Units: % MDL: 0.1	% Clay Units: % MDL: 0.1	% Fines Units: %
CB01	1-1 (0-3.28 ft)	0.0	51.7	21.5	26.8	48.3
CB02	1-1 (3.28-5 ft)	3.1	93.2	0.6	3.1	3.7
CB03	1-2 (5-8.5 ft)	9.7	84.8	1.1	4.4	5.5
CB04	1-2 (8.5-10 ft)	0	8.7	33.5	57.8	91.3
CB05	1-3 (10-12.54 ft)	0	5.8	29.3	64.9	94.2
CB06	2-1 (0-1.12 ft)	0	75.9	10.8	13.3	24.1
CB07	2-1 (1.12-4.66 ft)	6.7	91.9	0.2	1.2	1.4
CB08	2-2 (4.66-5 ft)	0	53.7	10.3	36	46.3
CB09	3-1 (0-5 ft)	0	37.2	24.9	37.9	62.8
CB10	3-2 (5-10 ft)	0	31.5	29	39.5	68.5
CB11	3-3 (10-15 ft)	0	7.9	42.3	49.8	92.1
CB12	3-4 (15-18.42 ft)	0	9.6	41.6	48.8	90.4
CB23	4-1 (0-4.4 ft)	0.0	27.4	27.3	45.3	72.6
CB24	4-2 (4.4-9.4 ft)	0.0	10.6	38.9	50.5	89.4
CB25	4-3 (9.4-17.4 ft)	0.0	9	42.1	48.9	91
CB13	5-1 (0-5 ft)	0	4.5	42.1	53.4	95.5
CB14	5-2 (5-10 ft)	0	8	41.3	50.7	92
CB15	5-3 (10-11.84 ft)	0	12.4	36.6	51	87.6
CB16	6-1 (0-4.82 ft)	0	5.5	40.8	53.7	94.5
CB17	6-2 (4.82-9.38 ft)	0	1.0	39.6	59.4	99
CB18	7-1 (0-5 ft)	0	19.5	33.1	47.4	80.5
CB19	7-2 (5-10 ft)	0	12.8	41.1	46.1	87.2
CB20	7-3 (10-11.26 ft)	0	24.8	32.7	42.5	75.2
CB21	8-1 (0-5 ft)	0	17.3	36.6	46.1	82.7
CB22	8-2 (5-11 ft)	0	39.7	27.7	32.6	60.3

Name	SampleID	Total Sample Mean (mm)	Total Sample Median (mm)	Total Sample Stnd Dev (mm)	Total Sample Skewness (mm)	Total Sample Kurtosis (mm)
CB01	1-1 (0-3.28 ft)	0.12	0.11	0.11	0.72	2.84
CB02	1-1 (3.28-5 ft)	0.50	0.31	0.79	4.83	26.18
CB03	1-2 (5-8.5 ft)	0.85	0.44	1.30	2.58	7.97
CB04	1-2 (8.5-10 ft)	0.04	0.00	0.09	4.71	30.66
CB05	1-3 (10-12.54 ft)	0.03	0.00	0.06	6.28	60.40
CB06	2-1 (0-1.12 ft)	0.23	0.22	0.18	1.21	5.31
CB07	2-1 (1.12-4.66 ft)	0.73	0.40	1.10	3.20	11.82
CB08	2-2 (4.66-5 ft)	0.11	0.14	0.11	1.63	18.00
CB09	3-1 (0-5 ft)	0.06	0.03	0.08	7.19	129.05
CB10	3-2 (5-10 ft)	0.05	0.03	0.06	5.70	149.33
CB11	3-3 (10-15 ft)	0.03	0.03	0.05	12.25	311.14
CB12	3-4 (15-18.42 ft)	0.03	0.03	0.09	13.87	256.93
CB23	4-1 (0-4.4 ft)	0.06	0.03	0.08	1.71	5.47
CB24	4-2 (4.4-9.4 ft)	0.03	0.00	0.05	2.88	11.55
CB25	4-3 (9.4-17.4 ft)					
CB13	5-1 (0-5 ft)					
CB14	5-2 (5-10 ft)	0.03	0.00	0.06	7.07	90.17
CB15	5-3 (10-11.84 ft)	0.03	0.00	0.06	3.35	19.80
CB16	6-1 (0-4.82 ft)	0.03	0.00	0.05	4.59	27.63
CB17	6-2 (4.82-9.38 ft)					
CB18	7-1 (0-5 ft)	0.05	0.03	0.07	1.71	4.80
CB19	7-2 (5-10 ft)	0.03	0.03	0.05	6.26	110.29
CB20	7-3 (10-11.26 ft)	0.06	0.03	0.09	7.21	118.69
CB21	8-1 (0-5 ft)	0.06	0.03	0.11	3.39	17.13
CB22	8-2 (5-11 ft)	0.16	0.03	0.22	1.99	7.51

Appendix D

Chemical Sediment Analysis Results

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Certificate of Analysis

Final Report

Laboratory Order ID 21A0319

Client Name:	Virginia Institute of Marine Science 1370 Greate Road Gloucester, VA 23062-1346	Date Received:	January 8, 2021 12:00
		Date Issued:	January 15, 2021 16:14
		Project Number:	[none]
Submitted To:	Donna Milligan	Purchase Order:	PCO2632666
Client Site I.D.:	Shallow Water Dredging		

Enclosed are the results of analyses for samples received by the laboratory on 01/08/2021 12:00. If you have any questions concerning this report, please feel free to contact the laboratory.

Sincerely,

Ted Soyars

Technical Director

End Notes:

The test results listed in this report relate only to the samples submitted to the laboratory and as received by the Laboratory.

Unless otherwise noted, the test results for solid materials are calculated on a wet weight basis. Analyses for pH, dissolved oxygen, temperature, residual chlorine and sulfite that are performed in the laboratory do not meet NELAC requirements due to extremely short holding times. These analyses should be performed in the field. The results of field analyses performed by the Sampler included in the Certificate of Analysis are done so at the client's request and are not included in the laboratory's fields of certification nor have they been audited for adherence to a reference method or procedure.

The signature on the final report certifies that these results conform to all applicable NELAC standards unless otherwise specified. For a complete list of the Laboratory's NELAC certified parameters please contact customer service.

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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:	January 15, 2021 16:14
		Project Number:	[none]
		Purchase Order:	PCO2632666
Submitted To:	Donna Milligan		
Client Site I.D.:	Shallow Water Dredging		

ANALYTICAL REPORT FOR SAMPLES

Laboratory Order ID 21A0319

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Timberneck up creek	21A0319-01	Solids	01/07/2021 13:35	01/08/2021 12:00
Timberneck down creek	21A0319-02	Solids	01/07/2021 13:18	01/08/2021 12:00
Cedarbush up creek	21A0319-03	Solids	01/07/2021 13:01	01/08/2021 12:00
Cedarbush down creek	21A0319-04	Solids	01/07/2021 12:51	01/08/2021 12:00
Aberdeen up creek	21A0319-05	Solids	01/07/2021 12:27	01/08/2021 12:00
Aberdeen down creek	21A0319-06	Solids	01/07/2021 12:11	01/08/2021 12:00

PCB results have been calculated based on dry weight.

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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:	January 15, 2021 16:14
		Project Number:	[none]
		Purchase Order:	PCO2632666
Submitted To:	Donna Milligan		
Client Site I.D.:	Shallow Water Dredging		

Laboratory Order ID: 21A0319

Analytical Results

Sample I.D. Cedarbush up creek **Laboratory Sample ID:** 21A0319-03

Grab Date/Time: 01/07/2021 13:01

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	03	SW6010D	<0.100 mg/L		0.100	1	01/12/21 10:15	01/13/21 10:38	SNL
TCLP Arsenic	03	SW6010D	<0.100 mg/L		0.100	1	01/12/21 10:15	01/13/21 10:38	SNL
TCLP Barium	03	SW6010D	<5.00 mg/L		5.00	1	01/12/21 10:15	01/13/21 10:38	SNL
TCLP Cadmium	03	SW6010D	<0.0400 mg/L		0.0400	1	01/12/21 10:15	01/13/21 10:38	SNL
TCLP Chromium	03	SW6010D	<0.100 mg/L		0.100	1	01/12/21 10:15	01/13/21 10:38	SNL
TCLP Mercury	03	SW7470A	<0.008 mg/L		0.008	1	01/12/21 13:59	01/13/21 12:52	MWL
TCLP Lead	03	SW6010D	<0.100 mg/L		0.100	1	01/12/21 10:15	01/13/21 10:38	SNL
TCLP Selenium	03	SW6010D	<0.250 mg/L		0.250	1	01/12/21 10:15	01/13/21 10:38	SNL
TCLP Extraction Fluid, Metals	03	SW1311	**1 #**		--	1	01/11/21 16:15	01/11/21 16:15	ESW
Volatile Organic Compounds by GC									
Methyl-t-butyl ether (MTBE)	03	SW8021B	<5.00 ug/kg		5.00	1	01/12/21 01:51	01/12/21 01:51	MAK
Benzene	03	SW8021B	<5.00 ug/kg		5.00	1	01/12/21 01:51	01/12/21 01:51	MAK
Toluene	03	SW8021B	<5.00 ug/kg		5.00	1	01/12/21 01:51	01/12/21 01:51	MAK
Ethylbenzene	03	SW8021B	<5.00 ug/kg		5.00	1	01/12/21 01:51	01/12/21 01:51	MAK
m+p-Xylenes	03	SW8021B	<10.0 ug/kg		10.0	1	01/12/21 01:51	01/12/21 01:51	MAK
o-Xylene	03	SW8021B	<5.00 ug/kg		5.00	1	01/12/21 01:51	01/12/21 01:51	MAK
Xylenes, Total	03	SW8021B	<15.0 ug/kg		15.0	1	01/12/21 01:51	01/12/21 01:51	MAK
Surr: 2,5-Dibromotoluene (Surr PID)	*03*	*SW8021B*	*72.8 %*	*S*	*80-120*		*01/12/21 01:51*	*01/12/21 01:51*	*MAK*
Semivolatile Hydrocarbons by GC									
TPH-Semi-Volatiles (DRO)	03	SW8015C	<10.0 mg/kg		10.0	1	01/12/21 16:00	01/13/21 22:43	LBH2
Surr: Pentacosane (Surr)	*03*	*SW8015C*	*99.2 %*		*45-160*		*01/12/21 16:00*	*01/13/21 22:43*	*LBH2*
TCLP Semivolatile Organic Compounds									

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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:	January 15, 2021 16:14
		Project Number:	[none]
		Purchase Order:	PCO2632666
Submitted To:	Donna Milligan		
Client Site I.D.:	Shallow Water Dredging		

Laboratory Order ID: 21A0319

Analytical Results

Sample I.D. Cedarbush up creek **Laboratory Sample ID:** 21A0319-03

Grab Date/Time: 01/07/2021 13:01

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									
TCLP Extraction Fluid, SV Organics	03	SW1311	**1 #**		--	1	01/11/21 16:15	01/11/21 16:15	SMM
Organochlorine Pesticides and PCBs by GC/ECD									
PCB as Aroclor 1016	03	SW8082A	<0.268 mg/kg dry		0.268	1	01/11/21 10:50	01/12/21 13:09	LBH2
PCB as Aroclor 1221	03	SW8082A	<0.268 mg/kg dry		0.268	1	01/11/21 10:50	01/12/21 13:09	LBH2
PCB as Aroclor 1232	03	SW8082A	<0.268 mg/kg dry		0.268	1	01/11/21 10:50	01/12/21 13:09	LBH2
PCB as Aroclor 1242	03	SW8082A	<0.268 mg/kg dry		0.268	1	01/11/21 10:50	01/12/21 13:09	LBH2
PCB as Aroclor 1248	03	SW8082A	<0.268 mg/kg dry		0.268	1	01/11/21 10:50	01/12/21 13:09	LBH2
PCB as Aroclor 1254	03	SW8082A	<0.268 mg/kg dry		0.268	1	01/11/21 10:50	01/12/21 13:09	LBH2
PCB as Aroclor 1260	03	SW8082A	<0.268 mg/kg dry		0.268	1	01/11/21 10:50	01/12/21 13:09	LBH2
Surr: DCB	*03*	*SW8082A*	*81.0 %*		*30-105*		*01/11/21 10:50*	*01/12/21 13:09*	*LBH2*
Surr: TCMX	*03*	*SW8082A*	*93.2 %*		*30-105*		*01/11/21 10:50*	*01/12/21 13:09*	*LBH2*
TCLP Organochlorine Herbicides by GC/ECD									
TCLP 2,4,5-TP (Silvex)	03	SW8151A	<0.0005 mg/L		0.0005	1	01/12/21 14:30	01/14/21 18:25	LBH2
TCLP 2,4-D	03	SW8151A	<0.001 mg/L		0.001	1	01/12/21 14:30	01/14/21 18:25	LBH2
Surr: DCAA (Surr)	*03*	*SW8151A*	*63.4 %*		*60-112*		*01/12/21 14:30*	*01/14/21 18:25*	*LBH2*
TCLP Organochlorine Pesticides and PCBs by GC/ECD									
TCLP Chlordane	03	SW8081B	<0.030 mg/L		0.030	1	01/13/21 13:45	01/14/21 17:13	lbh2
TCLP Endrin	03	SW8081B	<0.005 mg/L		0.005	1	01/13/21 13:45	01/14/21 17:13	lbh2
TCLP gamma-BHC (Lindane)	03	SW8081B	<0.005 mg/L		0.005	1	01/13/21 13:45	01/14/21 17:13	lbh2
TCLP Heptachlor	03	SW8081B	<0.005 mg/L		0.005	1	01/13/21 13:45	01/14/21 17:13	lbh2
TCLP Heptachlor Epoxide	03	SW8081B	<0.005 mg/L		0.005	1	01/13/21 13:45	01/14/21 17:13	lbh2
TCLP Methoxychlor	03	SW8081B	<0.005 mg/L		0.005	1	01/13/21 13:45	01/14/21 17:13	lbh2
TCLP Toxaphene	03	SW8081B	<0.500 mg/L		0.500	1	01/13/21 13:45	01/14/21 17:13	lbh2
Surr: TCMX	*03*	*SW8081B*	*36.7 %*		*18-112*		*01/13/21 13:45*	*01/14/21 17:13*	*lbh2*

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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:	January 15, 2021 16:14
		Project Number:	[none]
		Purchase Order:	PCO2632666
Submitted To:	Donna Milligan		
Client Site I.D.:	Shallow Water Dredging		

Laboratory Order ID: 21A0319

Analytical Results

Sample I.D. Cedarbush up creek **Laboratory Sample ID:** 21A0319-03

Grab Date/Time: 01/07/2021 13:01

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 Pesticides and PCBs by GC/ECD									
Surr: DCB	*03*	*SW8081B*	*32.6 %*		*27-131*		*01/13/21 13:45*	*01/14/21 17:13*	*lbh2*
Wet Chemistry Analysis									
Percent Solids	03	SM22 2540G-2011	**36.5 %**		0.10	1	01/09/21 13:30	01/09/21 13:30	TLF

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Final Report

Client Name:	Virginia Institute of Marine Science 1370 Greate Road Gloucester VA, 23062-1346	Date Issued: Project Number: Purchase Order:	January 15, 2021 16:14 [none] PCO2632666
Submitted To:	Donna Milligan		
Client Site I.D.:	Shallow Water Dredging		

Laboratory Order ID: 21A0319

Analytical Results

Sample I.D. Cedarbush down creek **Laboratory Sample ID:** 21A0319-04

Grab Date/Time: 01/07/2021 12:51

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	04	SW6010D	<0.100 mg/L		0.100	1	01/12/21 10:15	01/13/21 10:41	SNL
TCLP Arsenic	04	SW6010D	<0.100 mg/L		0.100	1	01/12/21 10:15	01/13/21 10:41	SNL
TCLP Barium	04	SW6010D	<5.00 mg/L		5.00	1	01/12/21 10:15	01/13/21 10:41	SNL
TCLP Cadmium	04	SW6010D	<0.0400 mg/L		0.0400	1	01/12/21 10:15	01/13/21 10:41	SNL
TCLP Chromium	04	SW6010D	<0.100 mg/L		0.100	1	01/12/21 10:15	01/13/21 10:41	SNL
TCLP Mercury	04	SW7470A	<0.008 mg/L		0.008	1	01/12/21 13:59	01/13/21 12:54	MWL
TCLP Lead	04	SW6010D	<0.100 mg/L		0.100	1	01/12/21 10:15	01/13/21 10:41	SNL
TCLP Selenium	04	SW6010D	<0.250 mg/L		0.250	1	01/12/21 10:15	01/13/21 10:41	SNL
TCLP Extraction Fluid, Metals	04	SW1311	**1 #**		--	1	01/11/21 16:15	01/11/21 16:15	ESW
Volatile Organic Compounds by GC									
Methyl-t-butyl ether (MTBE)	04	SW8021B	<5.00 ug/kg		5.00	1	01/12/21 02:31	01/12/21 02:31	MAK
Benzene	04	SW8021B	<5.00 ug/kg		5.00	1	01/12/21 02:31	01/12/21 02:31	MAK
Toluene	04	SW8021B	<5.00 ug/kg		5.00	1	01/12/21 02:31	01/12/21 02:31	MAK
Ethylbenzene	04	SW8021B	<5.00 ug/kg		5.00	1	01/12/21 02:31	01/12/21 02:31	MAK
m+p-Xylenes	04	SW8021B	<10.0 ug/kg		10.0	1	01/12/21 02:31	01/12/21 02:31	MAK
o-Xylene	04	SW8021B	<5.00 ug/kg		5.00	1	01/12/21 02:31	01/12/21 02:31	MAK
Xylenes, Total	04	SW8021B	<15.0 ug/kg		15.0	1	01/12/21 02:31	01/12/21 02:31	MAK
Surr: 2,5-Dibromotoluene (Surr PID)	*04*	*SW8021B*	*78.6 %*	*S*	*80-120*		*01/12/21 02:31*	*01/12/21 02:31*	*MAK*
Semivolatile Hydrocarbons by GC									
TPH-Semi-Volatiles (DRO)	04	SW8015C	<19.6 mg/kg		19.6	1	01/12/21 16:00	01/13/21 23:09	LBH2
Surr: Pentacosane (Surr)	*04*	*SW8015C*	*87.6 %*		*45-160*		*01/12/21 16:00*	*01/13/21 23:09*	*LBH2*
TCLP Semivolatile Organic Compounds									

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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:	January 15, 2021 16:14
		Project Number:	[none]
		Purchase Order:	PCO2632666
Submitted To:	Donna Milligan		
Client Site I.D.:	Shallow Water Dredging		

Laboratory Order ID: 21A0319

Analytical Results

Sample I.D. Cedarbush down creek **Laboratory Sample ID:** 21A0319-04

Grab Date/Time: 01/07/2021 12:51

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									
TCLP Extraction Fluid, SV Organics	04	SW1311	**1 #**		--	1	01/11/21 16:15	01/11/21 16:15	SMM
Organochlorine Pesticides and PCBs by GC/ECD									
PCB as Aroclor 1016	04	SW8082A	<0.251 mg/kg dry		0.251	1	01/11/21 10:50	01/12/21 13:29	LBH2
PCB as Aroclor 1221	04	SW8082A	<0.251 mg/kg dry		0.251	1	01/11/21 10:50	01/12/21 13:29	LBH2
PCB as Aroclor 1232	04	SW8082A	<0.251 mg/kg dry		0.251	1	01/11/21 10:50	01/12/21 13:29	LBH2
PCB as Aroclor 1242	04	SW8082A	<0.251 mg/kg dry		0.251	1	01/11/21 10:50	01/12/21 13:29	LBH2
PCB as Aroclor 1248	04	SW8082A	<0.251 mg/kg dry		0.251	1	01/11/21 10:50	01/12/21 13:29	LBH2
PCB as Aroclor 1254	04	SW8082A	<0.251 mg/kg dry		0.251	1	01/11/21 10:50	01/12/21 13:29	LBH2
PCB as Aroclor 1260	04	SW8082A	<0.251 mg/kg dry		0.251	1	01/11/21 10:50	01/12/21 13:29	LBH2
Surr: DCB	*04*	*SW8082A*	*86.0 %*		*30-105*		*01/11/21 10:50*	*01/12/21 13:29*	*LBH2*
Surr: TCMX	*04*	*SW8082A*	*91.5 %*		*30-105*		*01/11/21 10:50*	*01/12/21 13:29*	*LBH2*
TCLP Organochlorine Herbicides by GC/ECD									
TCLP 2,4,5-TP (Silvex)	04	SW8151A	<0.0005 mg/L		0.0005	1	01/12/21 14:30	01/14/21 18:51	LBH2
TCLP 2,4-D	04	SW8151A	<0.001 mg/L		0.001	1	01/12/21 14:30	01/14/21 18:51	LBH2
Surr: DCAA (Surr)	*04*	*SW8151A*	*79.1 %*		*60-112*		*01/12/21 14:30*	*01/14/21 18:51*	*LBH2*
TCLP Organochlorine Pesticides and PCBs by GC/ECD									
TCLP Chlordane	04	SW8081B	<0.030 mg/L		0.030	1	01/13/21 13:45	01/14/21 17:30	lbh2
TCLP Endrin	04	SW8081B	<0.005 mg/L		0.005	1	01/13/21 13:45	01/14/21 17:30	lbh2
TCLP gamma-BHC (Lindane)	04	SW8081B	<0.005 mg/L		0.005	1	01/13/21 13:45	01/14/21 17:30	lbh2
TCLP Heptachlor	04	SW8081B	<0.005 mg/L		0.005	1	01/13/21 13:45	01/14/21 17:30	lbh2
TCLP Heptachlor Epoxide	04	SW8081B	<0.005 mg/L		0.005	1	01/13/21 13:45	01/14/21 17:30	lbh2
TCLP Methoxychlor	04	SW8081B	<0.005 mg/L		0.005	1	01/13/21 13:45	01/14/21 17:30	lbh2
TCLP Toxaphene	04	SW8081B	<0.500 mg/L		0.500	1	01/13/21 13:45	01/14/21 17:30	lbh2
Surr: TCMX	*04*	*SW8081B*	*74.7 %*		*18-112*		*01/13/21 13:45*	*01/14/21 17:30*	*lbh2*

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Final Report

Client Name:	Virginia Institute of Marine Science 1370 Greate Road Gloucester VA, 23062-1346	Date Issued:	January 15, 2021 16:14
		Project Number:	[none]
		Purchase Order:	PCO2632666
Submitted To:	Donna Milligan		
Client Site I.D.:	Shallow Water Dredging		

Laboratory Order ID: 21A0319

Analytical Results

Sample I.D. Cedarbush down creek **Laboratory Sample ID:** 21A0319-04

Grab Date/Time: 01/07/2021 12:51

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 Pesticides and PCBs by GC/ECD									
Surr: DCB	*04*	*SW8081B*	*37.0 %*		*27-131*		*01/13/21 13:45*	*01/14/21 17:30*	*lbh2*
Wet Chemistry Analysis									
Percent Solids	04	SM22 2540G-2011	**39.7 %**		0.10	1	01/09/21 13:30	01/09/21 13:30	TLF

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Analytical Summary

Preparation Method:

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Wet Chemistry Analysis		**Preparation Method:**	**No Prep Wet Chem**		
21A0319-01	10.0 g / 10.0 mL	SM22 2540G-2011	BEA0198	SEA0179	
21A0319-02	10.0 g / 10.0 mL	SM22 2540G-2011	BEA0198	SEA0179	
21A0319-03	10.0 g / 10.0 mL	SM22 2540G-2011	BEA0198	SEA0179	
21A0319-04	10.0 g / 10.0 mL	SM22 2540G-2011	BEA0198	SEA0179	
21A0319-05	10.0 g / 10.0 mL	SM22 2540G-2011	BEA0198	SEA0179	
21A0319-06	10.0 g / 10.0 mL	SM22 2540G-2011	BEA0198	SEA0179	

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
TCLP Metals by 6000/7000 Series Methods		**Preparation Method:**	**SW1311 Metals**		
21A0319-01	100 g / 2000 mL	SW1311	BEA0240	SEA0218	
21A0319-02	100 g / 2000 mL	SW1311	BEA0240	SEA0218	
21A0319-03	100 g / 2000 mL	SW1311	BEA0240	SEA0218	
21A0319-04	100 g / 2000 mL	SW1311	BEA0240	SEA0218	
21A0319-05	100 g / 2000 mL	SW1311	BEA0240	SEA0218	
21A0319-06	100 g / 2000 mL	SW1311	BEA0240	SEA0218	

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
TCLP Metals by 6000/7000 Series Methods		**Preparation Method:**	**SW3010A**		
21A0319-01	10.0 mL / 50.0 mL	SW6010D	BEA0247	SEA0269	AE00133
21A0319-02	10.0 mL / 50.0 mL	SW6010D	BEA0247	SEA0269	AE00133
21A0319-03	10.0 mL / 50.0 mL	SW6010D	BEA0247	SEA0269	AE00133
21A0319-04	10.0 mL / 50.0 mL	SW6010D	BEA0247	SEA0269	AE00133
21A0319-05	10.0 mL / 50.0 mL	SW6010D	BEA0247	SEA0269	AE00133
21A0319-06	10.0 mL / 50.0 mL	SW6010D	BEA0247	SEA0269	AE00133

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
TCLP Semivolatile Organic Compounds		**Preparation Method:**	**SW3510C**		

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Submitted To:	Donna Milligan		
Client Site I.D.:	Shallow Water Dredging		

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
21A0319-01	100 g / 2000 mL	SW1311	BEA0257	SEA0233	AL00074
21A0319-02	100 g / 2000 mL	SW1311	BEA0257	SEA0233	AL00074
21A0319-03	100 g / 2000 mL	SW1311	BEA0257	SEA0233	AL00074
21A0319-04	100 g / 2000 mL	SW1311	BEA0257	SEA0233	AL00074
21A0319-05	100 g / 2000 mL	SW1311	BEA0257	SEA0233	AL00074
21A0319-06	100 g / 2000 mL	SW1311	BEA0257	SEA0233	AL00074
TCLP Organochlorine Herbicides by GC/ECD		**Preparation Method:**	**SW3510C**		
21A0319-01	100 mL / 5.00 mL	SW8151A	BEA0266	SEA0330	AK00094
21A0319-02	100 mL / 5.00 mL	SW8151A	BEA0266	SEA0330	AK00094
21A0319-03	100 mL / 5.00 mL	SW8151A	BEA0266	SEA0330	AK00094
21A0319-04	100 mL / 5.00 mL	SW8151A	BEA0266	SEA0330	AK00094
21A0319-05	100 mL / 5.00 mL	SW8151A	BEA0266	SEA0330	AK00094
21A0319-06	100 mL / 5.00 mL	SW8151A	BEA0266	SEA0330	AK00094
Semivolatile Hydrocarbons by GC		**Preparation Method:**	**SW3510C**		
21A0319-01	50.3 g / 1.00 mL	SW8015C	BEA0297	SEA0276	AA10005
21A0319-02	52.0 g / 1.00 mL	SW8015C	BEA0297	SEA0276	AA10005
21A0319-03	51.1 g / 1.00 mL	SW8015C	BEA0297	SEA0276	AA10005
21A0319-04	51.1 g / 2.00 mL	SW8015C	BEA0297	SEA0276	AA10005
21A0319-05	50.8 g / 1.00 mL	SW8015C	BEA0297	SEA0276	AA10005
21A0319-06	50.3 g / 2.00 mL	SW8015C	BEA0297	SEA0276	AA10005
TCLP Organochlorine Pesticides and PCBs by GC/ECD		**Preparation Method:**	**SW3510C**		
21A0319-01	100 mL / 1.00 mL	SW8081B	BEA0313	SEA0326	AA10033
21A0319-02	100 mL / 1.00 mL	SW8081B	BEA0313	SEA0326	AA10033
21A0319-03	100 mL / 1.00 mL	SW8081B	BEA0313	SEA0326	AA10033
21A0319-04	100 mL / 1.00 mL	SW8081B	BEA0313	SEA0326	AA10033
21A0319-05	100 mL / 1.00 mL	SW8081B	BEA0313	SEA0326	AA10033
21A0319-06	100 mL / 1.00 mL	SW8081B	BEA0313	SEA0326	AA10033

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Organochlorine Pesticides and PCBs by GC/ECD		**Preparation Method:**	**SW3550B**		
21A0319-01	30.0 g / 5.00 mL	SW8082A	BEA0209	SEA0256	AJ00088
21A0319-02	30.0 g / 5.00 mL	SW8082A	BEA0209	SEA0256	AJ00088
21A0319-03	30.6 g / 5.00 mL	SW8082A	BEA0209	SEA0256	AJ00088
21A0319-04	30.1 g / 5.00 mL	SW8082A	BEA0209	SEA0256	AJ00088

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Client Site I.D.:	Shallow Water Dredging		

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
21A0319-05	30.3 g / 5.00 mL	SW8082A	BEA0209	SEA0256	AJ00088
21A0319-06	31.9 g / 5.00 mL	SW8082A	BEA0209	SEA0256	AJ00088

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Volatile Organic Compounds by GC		**Preparation Method:**	**SW5030B**		
21A0319-01	5.33 g / 5.00 mL	SW8021B	BEA0220	SEA0209	AA10001
21A0319-02	5.32 g / 5.00 mL	SW8021B	BEA0220	SEA0209	AA10001
21A0319-03	5.11 g / 5.00 mL	SW8021B	BEA0220	SEA0209	AA10001
21A0319-04	5.03 g / 5.00 mL	SW8021B	BEA0220	SEA0209	AA10001
21A0319-05	5.14 g / 5.00 mL	SW8021B	BEA0220	SEA0209	AA10001
21A0319-06	5.22 g / 5.00 mL	SW8021B	BEA0220	SEA0209	AA10001

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
TCLP Metals by 6000/7000 Series Methods		**Preparation Method:**	**SW7470A**		
21A0319-01	1.00 mL / 20.0 mL	SW7470A	BEA0264	SEA0263	AA10039
21A0319-02	1.00 mL / 20.0 mL	SW7470A	BEA0264	SEA0263	AA10039
21A0319-03	1.00 mL / 20.0 mL	SW7470A	BEA0264	SEA0263	AA10039
21A0319-04	1.00 mL / 20.0 mL	SW7470A	BEA0264	SEA0263	AA10039
21A0319-05	1.00 mL / 20.0 mL	SW7470A	BEA0264	SEA0263	AA10039
21A0319-06	1.00 mL / 20.0 mL	SW7470A	BEA0264	SEA0263	AA10039

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TCLP Metals by 6000/7000 Series Methods - Quality Control

Air Water & Soil Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BEA0240 - SW1311 Metals										
Blank (BEA0240-BLK1)				Prepared & Analyzed: 01/11/2021						
Extraction Fluid, Metals	1 #	0	#							
Blank (BEA0240-BLK2)				Prepared & Analyzed: 01/11/2021						
Extraction Fluid, Metals	2 #	0	#							
Batch BEA0247 - SW3010A										
Blank (BEA0247-BLK1)				Prepared: 01/12/2021 Analyzed: 01/13/2021						
Arsenic	<0.100 mg/L	0.100	mg/L							
Barium	<5.00 mg/L	5.00	mg/L							
Cadmium	<0.0400 mg/L	0.0400	mg/L							
Chromium	<0.100 mg/L	0.100	mg/L							
Lead	<0.100 mg/L	0.100	mg/L							
Selenium	<0.250 mg/L	0.250	mg/L							
Silver	<0.100 mg/L	0.100	mg/L							
LCS (BEA0247-BS1)				Prepared: 01/12/2021 Analyzed: 01/13/2021						
Arsenic	2.36 mg/L	0.100	mg/L	2.50	mg/L	94.3	80-120			
Barium	<5.00 mg/L	5.00	mg/L	2.50	mg/L	97.8	80-120			
Cadmium	2.30 mg/L	0.0400	mg/L	2.50	mg/L	92.1	80-120			
Chromium	2.31 mg/L	0.100	mg/L	2.50	mg/L	92.4	80-120			
Lead	2.28 mg/L	0.100	mg/L	2.50	mg/L	91.3	80-120			
Selenium	2.23 mg/L	0.250	mg/L	2.50	mg/L	89.3	80-120			
Silver	0.445 mg/L	0.100	mg/L	0.500	mg/L	88.9	80-120			
LCS Dup (BEA0247-BSD1)				Prepared: 01/12/2021 Analyzed: 01/13/2021						
Arsenic	2.30 mg/L	0.100	mg/L	2.50	mg/L	92.0	80-120	2.53	20	
Barium	<5.00 mg/L	5.00	mg/L	2.50	mg/L	95.9	80-120	2.00	20	
Cadmium	2.24 mg/L	0.0400	mg/L	2.50	mg/L	89.6	80-120	2.74	20	
Chromium	2.22 mg/L	0.100	mg/L	2.50	mg/L	88.9	80-120	3.82	20	
Lead	2.24 mg/L	0.100	mg/L	2.50	mg/L	89.6	80-120	1.91	20	
Selenium	2.20 mg/L	0.250	mg/L	2.50	mg/L	88.0	80-120	1.47	20	
Silver	0.442 mg/L	0.100	mg/L	0.500	mg/L	88.4	80-120	0.582	20	

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Client Site I.D.:	Shallow Water Dredging		

TCLP Metals by 6000/7000 Series Methods - Quality Control

Air Water & Soil Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BEA0247 - SW3010A										
Matrix Spike (BEA0247-MS1)	**Source: 21A0319-01**			Prepared: 01/12/2021 Analyzed: 01/13/2021						
Arsenic	2.32 mg/L	0.100	mg/L	2.50	<0.100 mg/L	92.6	75-125			
Barium	<5.00 mg/L	5.00	mg/L	2.50	<5.00 mg/L	85.2	75-125			
Cadmium	2.25 mg/L	0.0400	mg/L	2.50	<0.0400 mg/L	90.1	75-125			
Chromium	2.25 mg/L	0.100	mg/L	2.50	<0.100 mg/L	90.2	75-125			
Lead	2.25 mg/L	0.100	mg/L	2.50	<0.100 mg/L	89.9	75-125			
Selenium	2.21 mg/L	0.250	mg/L	2.50	<0.250 mg/L	88.4	75-125			
Silver	0.372 mg/L	0.100	mg/L	0.500	<0.100 mg/L	74.3	75-125			M
Matrix Spike Dup (BEA0247-MSD1)	**Source: 21A0319-01**			Prepared: 01/12/2021 Analyzed: 01/13/2021						
Arsenic	2.35 mg/L	0.100	mg/L	2.50	<0.100 mg/L	93.9	75-125	1.29	20	
Barium	<5.00 mg/L	5.00	mg/L	2.50	<5.00 mg/L	101	75-125	17.1	20	
Cadmium	2.27 mg/L	0.0400	mg/L	2.50	<0.0400 mg/L	90.8	75-125	0.758	20	
Chromium	2.30 mg/L	0.100	mg/L	2.50	<0.100 mg/L	91.8	75-125	1.82	20	
Lead	2.27 mg/L	0.100	mg/L	2.50	<0.100 mg/L	90.9	75-125	1.19	20	
Selenium	2.24 mg/L	0.250	mg/L	2.50	<0.250 mg/L	89.7	75-125	1.44	20	
Silver	0.452 mg/L	0.100	mg/L	0.500	<0.100 mg/L	90.5	75-125	19.6	20	
Batch BEA0264 - SW7470A										
Blank (BEA0264-BLK1)				Prepared: 01/12/2021 Analyzed: 01/13/2021						
Mercury	<0.008 mg/L	0.008	mg/L							
LCS (BEA0264-BS1)				Prepared: 01/12/2021 Analyzed: 01/13/2021						
Mercury	0.048 mg/L	0.008	mg/L	0.0500	mg/L	96.1	80-120			
LCS Dup (BEA0264-BSD1)				Prepared: 01/12/2021 Analyzed: 01/13/2021						
Mercury	0.048 mg/L	0.008	mg/L	0.0500	mg/L	95.9	80-120	0.265	20	

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TCLP Metals by 6000/7000 Series Methods - Quality Control

Air Water & Soil Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BEA0264 - SW7470A										
Matrix Spike (BEA0264-MS1)	**Source: 21A0319-01**			Prepared: 01/12/2021 Analyzed: 01/13/2021						
Mercury	0.050 mg/L	0.008	mg/L	0.0500	<0.008 mg/L	99.8	80-120			
Matrix Spike Dup (BEA0264-MSD1)	**Source: 21A0319-01**			Prepared: 01/12/2021 Analyzed: 01/13/2021						
Mercury	0.051 mg/L	0.008	mg/L	0.0500	<0.008 mg/L	102	80-120	2.12	20	

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Volatile Organic Compounds by GC - Quality Control

Air Water & Soil Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BEA0220 - SW5030B										
Blank (BEA0220-BLK1)				Prepared & Analyzed: 01/11/2021						
Methyl-t-butyl ether (MTBE)	<5.00 ug/kg	5.00	ug/kg							
Benzene	<5.00 ug/kg	5.00	ug/kg							
Toluene	<5.00 ug/kg	5.00	ug/kg							
Ethylbenzene	<5.00 ug/kg	5.00	ug/kg							
m+p-Xylenes	<10.0 ug/kg	10.0	ug/kg							
o-Xylene	<5.00 ug/kg	5.00	ug/kg							
Xylenes, Total	<15.0 ug/kg	15.0	ug/kg							
Surr: 2,5-Dibromotoluene (Surr PID)	82.3		ug/L	100		82.3	80-120			
LCS (BEA0220-BS1)				Prepared & Analyzed: 01/11/2021						
Methyl-t-butyl ether (MTBE)	81.3 ug/kg	5.00	ug/kg	100	ug/kg	81.3	70-130			
Benzene	78.6 ug/kg	5.00	ug/kg	100	ug/kg	78.6	70-130			
Toluene	79.5 ug/kg	5.00	ug/kg	100	ug/kg	79.5	70-130			
Ethylbenzene	86.8 ug/kg	5.00	ug/kg	100	ug/kg	86.8	70-130			
m+p-Xylenes	174 ug/kg	10.0	ug/kg	200	ug/kg	87.0	70-130			
o-Xylene	83.6 ug/kg	5.00	ug/kg	100	ug/kg	83.6	70-130			
Surr: 2,5-Dibromotoluene (Surr PID)	85.7		ug/L	100	ug/L	85.7	80-120			
Matrix Spike (BEA0220-MS1)		**Source: 21A0319-04**		Prepared & Analyzed: 01/12/2021						
Methyl-t-butyl ether (MTBE)	60.0 ug/kg	5.00	ug/kg	94.9	<5.00 ug/kg	63.2	70-130			M
Benzene	51.6 ug/kg	5.00	ug/kg	94.9	<5.00 ug/kg	54.4	70-130			M
Toluene	52.3 ug/kg	5.00	ug/kg	94.9	<5.00 ug/kg	55.1	70-130			M
Ethylbenzene	56.9 ug/kg	5.00	ug/kg	94.9	<5.00 ug/kg	59.9	70-130			M
m+p-Xylenes	111 ug/kg	10.0	ug/kg	190	<10.0 ug/kg	58.7	70-130			M
o-Xylene	53.7 ug/kg	5.00	ug/kg	94.9	<5.00 ug/kg	56.6	70-130			M
Surr: 2,5-Dibromotoluene (Surr PID)	81.0		ug/L	100	ug/L	81.0	80-120			
Matrix Spike Dup (BEA0220-MSD1)		**Source: 21A0319-04**		Prepared & Analyzed: 01/12/2021						
Methyl-t-butyl ether (MTBE)	59.9 ug/kg	5.00	ug/kg	94.5	<5.00 ug/kg	63.4	70-130	0.0471	20	M
Benzene	50.8 ug/kg	5.00	ug/kg	94.5	<5.00 ug/kg	53.7	70-130	1.67	20	M
Toluene	51.3 ug/kg	5.00	ug/kg	94.5	<5.00 ug/kg	54.3	70-130	1.84	20	M
Ethylbenzene	56.2 ug/kg	5.00	ug/kg	94.5	<5.00 ug/kg	59.4	70-130	1.22	20	M

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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:	January 15, 2021 16:14
		Project Number:	[none]
		Purchase Order:	PCO2632666
Submitted To:	Donna Milligan		
Client Site I.D.:	Shallow Water Dredging		

Volatile Organic Compounds by GC - Quality Control

Air Water & Soil Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BEA0220 - SW5030B										
Matrix Spike Dup (BEA0220-MSD1)	**Source: 21A0319-04**		Prepared & Analyzed: 01/12/2021							
m+p-Xylenes	110 ug/kg	10.0	ug/kg	189	<10.0 ug/kg	58.3	70-130	1.06	20	M
o-Xylene	53.2 ug/kg	5.00	ug/kg	94.5	<5.00 ug/kg	56.3	70-130	0.892	20	M
Surr: 2,5-Dibromotoluene (Surr PID)	86.7		ug/L	100	ug/L	86.7	80-120			

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Semivolatile Hydrocarbons by GC - Quality Control

Air Water & Soil Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BEA0297 - SW3510C										
Blank (BEA0297-BLK1)				Prepared: 01/12/2021 Analyzed: 01/13/2021						
TPH-Semi-Volatiles (DRO)	<10.0 mg/kg	10.0	mg/kg							
Surr: Pentacosane (Surr)	3.54		mg/kg	5.00		70.8	45-160			
LCS (BEA0297-BS1)				Prepared: 01/12/2021 Analyzed: 01/13/2021						
TPH-Semi-Volatiles (DRO)	82.1 mg/kg	10.0	mg/kg	100	mg/kg	82.1	40-160			
Surr: Pentacosane (Surr)	4.34		mg/kg	5.00	mg/kg	86.9	45-160			
Matrix Spike (BEA0297-MS1)	**Source: 21A0351-03**			Prepared: 01/12/2021 Analyzed: 01/13/2021						
TPH-Semi-Volatiles (DRO)	886 mg/kg	50.0	mg/kg	100	1080 mg/kg	-192	40-160			M2
Surr: Pentacosane (Surr)	4.58		mg/kg	5.00	mg/kg	91.6	45-160			
Matrix Spike Dup (BEA0297-MSD1)	**Source: 21A0351-03**			Prepared: 01/12/2021 Analyzed: 01/13/2021						
TPH-Semi-Volatiles (DRO)	572 mg/kg	49.7	mg/kg	99.4	1080 mg/kg	-509	40-160	43.1	20	M2, P
Surr: Pentacosane (Surr)	4.14		mg/kg	4.97	mg/kg	83.3	45-160			

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Organochlorine Pesticides and PCBs by GC/ECD - Quality Control

Air Water & Soil Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BEA0209 - SW3550B										
Blank (BEA0209-BLK1)				Prepared: 01/11/2021 Analyzed: 01/12/2021						
PCB as Aroclor 1016	<0.100 mg/kg wet	0.100	mg/kg wet							
PCB as Aroclor 1221	<0.100 mg/kg wet	0.100	mg/kg wet							
PCB as Aroclor 1232	<0.100 mg/kg wet	0.100	mg/kg wet							
PCB as Aroclor 1242	<0.100 mg/kg wet	0.100	mg/kg wet							
PCB as Aroclor 1248	<0.100 mg/kg wet	0.100	mg/kg wet							
PCB as Aroclor 1254	<0.100 mg/kg wet	0.100	mg/kg wet							
PCB as Aroclor 1260	<0.100 mg/kg wet	0.100	mg/kg wet							
Surr: DCB	0.0333		mg/kg wet	0.0333		99.9	30-105			
Surr: TCMX	0.0274		mg/kg wet	0.0333		82.2	30-105			
LCS (BEA0209-BS1)				Prepared: 01/11/2021 Analyzed: 01/12/2021						
PCB as Aroclor 1016	0.173 mg/kg wet	0.100	mg/kg wet	0.167	mg/kg wet	104	60-140			
PCB as Aroclor 1260	0.168 mg/kg wet	0.100	mg/kg wet	0.167	mg/kg wet	101	60-140			
Surr: DCB	0.0353		mg/kg wet	0.0333	mg/kg wet	106	30-105			S
Surr: TCMX	0.0330		mg/kg wet	0.0333	mg/kg wet	99.1	30-105			
Matrix Spike (BEA0209-MS1)		**Source: 21A0235-01**		Prepared: 01/11/2021 Analyzed: 01/12/2021						
PCB as Aroclor 1016	0.200 mg/kg dry	0.106	mg/kg dry	0.177	<0.106 mg/kg dry	113	60-140			
PCB as Aroclor 1260	0.191 mg/kg dry	0.106	mg/kg dry	0.177	<0.106 mg/kg dry	108	60-140			
Surr: DCB	0.0393		mg/kg dry	0.0354	mg/kg dry	111	30-105			S
Surr: TCMX	0.0349		mg/kg dry	0.0354	mg/kg dry	98.5	30-105			
Matrix Spike Dup (BEA0209-MSD1)		**Source: 21A0235-01**		Prepared: 01/11/2021 Analyzed: 01/12/2021						
PCB as Aroclor 1016	0.210 mg/kg dry	0.111	mg/kg dry	0.185	<0.111 mg/kg dry	113	60-140	4.70	20	
PCB as Aroclor 1260	0.218 mg/kg dry	0.111	mg/kg dry	0.185	<0.111 mg/kg dry	118	60-140	13.1	20	
Surr: DCB	0.0429		mg/kg dry	0.0370	mg/kg dry	116	30-105			S
Surr: TCMX	0.0382		mg/kg dry	0.0370	mg/kg dry	103	30-105			

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Submitted To:	Donna Milligan		
Client Site I.D.:	Shallow Water Dredging		

TCLP Organochlorine Herbicides by GC/ECD - Quality Control

Air Water & Soil Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BEA0266 - SW3510C										
Blank (BEA0266-BLK1)				Prepared: 01/12/2021 Analyzed: 01/14/2021						
2,4,5-TP (Silvex)	<0.0005 mg/L	0.0005	mg/L							
2,4-D	<0.001 mg/L	0.001	mg/L							
Surr: DCAA (Surr)	0.00790		mg/L	0.0100		79.0	60-112			
LCS (BEA0266-BS1)				Prepared: 01/12/2021 Analyzed: 01/14/2021						
2,4,5-TP (Silvex)	0.004 mg/L	0.0005	mg/L	0.00500 mg/L		75.8	62-132			
2,4-D	0.004 mg/L	0.001	mg/L	0.00500 mg/L		82.9	74-139			
Surr: DCAA (Surr)	0.00553		mg/L	0.0100 mg/L		55.3	60-112			S
Matrix Spike (BEA0266-MS1)		Source: 21A0319-06		Prepared: 01/12/2021 Analyzed: 01/14/2021						
2,4,5-TP (Silvex)	0.004 mg/L	0.0005	mg/L	0.00500	<0.0005 mg/L	87.5	52-129			
2,4-D	0.005 mg/L	0.001	mg/L	0.00500	<0.001 mg/L	98.4	53-126			
Surr: DCAA (Surr)	0.00903		mg/L	0.0100 mg/L		90.3	60-112			
Matrix Spike Dup (BEA0266-MSD1)		Source: 21A0319-06		Prepared: 01/12/2021 Analyzed: 01/14/2021						
2,4,5-TP (Silvex)	0.004 mg/L	0.0005	mg/L	0.00500	<0.0005 mg/L	80.1	52-129	8.85	20	
2,4-D	0.004 mg/L	0.001	mg/L	0.00500	<0.001 mg/L	88.4	53-126	10.7	20	
Surr: DCAA (Surr)	0.00759		mg/L	0.0100 mg/L		75.9	60-112			

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Submitted To:	Donna Milligan		
Client Site I.D.:	Shallow Water Dredging		

TCLP Organochlorine Pesticides and PCBs by GC/ECD - Quality Control

Air Water & Soil Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BEA0313 - SW3510C										
Blank (BEA0313-BLK1)				Prepared: 01/13/2021 Analyzed: 01/14/2021						
Chlordane	<0.030 mg/L	0.030	mg/L							
Endrin	<0.005 mg/L	0.005	mg/L							
gamma-BHC (Lindane)	<0.005 mg/L	0.005	mg/L							
Heptachlor	<0.005 mg/L	0.005	mg/L							
Heptachlor Epoxide	<0.005 mg/L	0.005	mg/L							
Methoxychlor	<0.005 mg/L	0.005	mg/L							
Toxaphene	<0.500 mg/L	0.500	mg/L							
Surr: TCMX	0.00148		mg/L	0.00200		74.2	18-112			
Surr: DCB	0.000928		mg/L	0.00200		46.4	27-131			
LCS (BEA0313-BS1)				Prepared: 01/13/2021 Analyzed: 01/14/2021						
Endrin	<0.005 mg/L	0.005	mg/L	0.00100 mg/L		84.3	23-134			
Heptachlor	<0.005 mg/L	0.005	mg/L	0.00100 mg/L		80.5	23-134			
Heptachlor Epoxide	<0.005 mg/L	0.005	mg/L	0.00100 mg/L		83.9	23-134			
Methoxychlor	<0.005 mg/L	0.005	mg/L	0.00100 mg/L		102	23-134			
Surr: TCMX	0.00149		mg/L	0.00200 mg/L		74.3	18-112			
Surr: DCB	0.000920		mg/L	0.00200 mg/L		46.0	27-131			
LCS (BEA0313-BS2)				Prepared: 01/13/2021 Analyzed: 01/14/2021						
Toxaphene	<0.500 mg/L	0.500	mg/L	0.0250 mg/L		74.3	23-134			
Surr: TCMX	0.00123		mg/L	0.00200 mg/L		61.5	18-112			
Surr: DCB	0.000853		mg/L	0.00200 mg/L		42.7	27-131			
LCS (BEA0313-BS3)				Prepared: 01/13/2021 Analyzed: 01/14/2021						
Chlordane	<0.030 mg/L	0.030	mg/L	0.0250 mg/L		72.6	23-134			
Surr: TCMX	0.00139		mg/L	0.00200 mg/L		69.6	18-112			
Surr: DCB	0.000818		mg/L	0.00200 mg/L		40.9	27-131			

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Submitted To:	Donna Milligan		
Client Site I.D.:	Shallow Water Dredging		

TCLP Organochlorine Pesticides and PCBs by GC/ECD - Quality Control

Air Water & Soil Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BEA0313 - SW3510C										
Matrix Spike (BEA0313-MS1)	**Source: 21A0319-01**			Prepared: 01/13/2021 Analyzed: 01/14/2021						
Endrin	<0.005 mg/L	0.005	mg/L	0.00100	<0.005 mg/L	73.8	23-134			
Heptachlor	<0.005 mg/L	0.005	mg/L	0.00100	<0.005 mg/L	75.2	23-134			
Heptachlor Epoxide	<0.005 mg/L	0.005	mg/L	0.00100	<0.005 mg/L	72.9	23-134			
Methoxychlor	<0.005 mg/L	0.005	mg/L	0.00100	<0.005 mg/L	90.9	23-134			
Surr: TCMX	0.00137		mg/L	0.00200 mg/L		68.6	18-112			
Surr: DCB	0.00138		mg/L	0.00200 mg/L		68.8	27-131			
Matrix Spike Dup (BEA0313-MSD1)	**Source: 21A0319-01**			Prepared: 01/13/2021 Analyzed: 01/14/2021						
Endrin	<0.005 mg/L	0.005	mg/L	0.00100	<0.005 mg/L	84.5	23-134	13.5	20	
Heptachlor	<0.005 mg/L	0.005	mg/L	0.00100	<0.005 mg/L	89.5	23-134	17.4	20	
Heptachlor Epoxide	<0.005 mg/L	0.005	mg/L	0.00100	<0.005 mg/L	88.0	23-134	18.7	20	
Methoxychlor	<0.005 mg/L	0.005	mg/L	0.00100	<0.005 mg/L	103	23-134	12.5	20	
Surr: TCMX	0.00154		mg/L	0.00200 mg/L		77.0	18-112			
Surr: DCB	0.00173		mg/L	0.00200 mg/L		86.4	27-131			

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Wet Chemistry Analysis - Quality Control

Air Water & Soil Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BEA0198 - No Prep Wet Chem										
Blank (BEA0198-BLK1)				Prepared & Analyzed: 01/09/2021						
Percent Solids	100 %	0.10	%							
Duplicate (BEA0198-DUP1)		**Source: 21A0295-01**		Prepared & Analyzed: 01/09/2021						
Percent Solids	83.9 %	0.10	%		83.4 %			0.533	20	

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Certified Analyses included in this Report

Analyte	Certifications
SW1311 in Solids	
Extraction Fluid, Metals	VELAP
Extraction Fluid, SV Organics	VELAP
SW6010D in Non-Potable Water	
Arsenic	VELAP,WVDEP
Barium	VELAP,WVDEP
Cadmium	VELAP,WVDEP
Chromium	VELAP,WVDEP
Lead	VELAP,WVDEP
Selenium	VELAP,WVDEP
Silver	VELAP,WVDEP
SW7470A in Non-Potable Water	
Mercury	VELAP,WVDEP
SW8015C in Solids	
TPH-Semi-Volatiles (DRO)	VELAP,NC,WVDEP
SW8021B in Solids	
Methyl-t-butyl ether (MTBE)	VELAP,WVDEP
Benzene	VELAP,WVDEP
Toluene	VELAP,WVDEP
Ethylbenzene	VELAP,WVDEP
m+p-Xylenes	VELAP,WVDEP
o-Xylene	VELAP,WVDEP
Xylenes, Total	VELAP,WVDEP
SW8081B in Non-Potable Water	
Chlordane	VELAP,WVDEP
Endrin	VELAP,WVDEP
gamma-BHC (Lindane)	VELAP,WVDEP
Heptachlor	VELAP,WVDEP
Heptachlor Epoxide	VELAP,WVDEP
Methoxychlor	VELAP,WVDEP
Toxaphene	VELAP,WVDEP
SW8082A in Solids	
PCB as Aroclor 1016	VELAP,NC
PCB as Aroclor 1221	VELAP,NC
PCB as Aroclor 1232	VELAP,NC
PCB as Aroclor 1242	VELAP,NC

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Certified Analyses included in this Report

Analyte	Certifications
PCB as Aroclor 1248	VELAP,NC
PCB as Aroclor 1254	VELAP,NC
PCB as Aroclor 1260	VELAP,NC
SW8151A in Non-Potable Water	
2,4,5-TP (Silvex)	VELAP,WVDEP
2,4-D	VELAP,WVDEP

Code	Description	Laboratory ID	Expires
MdDOE	Maryland DE Drinking Water	341	12/31/2021
NC	North Carolina DENR	495	12/31/2021
NCDOH	North Carolina Department of Health	51714	07/31/2021
NJDEP	NELAC-New Jersey DEP	VA015	06/30/2021
NYDOH	New York DOH Drinking Water	12096	04/01/2021
PADEP	NELAC-Pennsylvania Certificate #006	68-03503	10/31/2021
VELAP	NELAC-Virginia Certificate #11064	460021	06/14/2021
WVDEP	West Virginia DEP	350	02/28/2021

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Summary of Data Qualifiers

M	Matrix spike recovery is outside established acceptance limits
M2	Sample was diluted due to matrix interference.
P	Duplicate analysis does not meet the acceptance criteria for precision
S	Surrogate recovery was outside acceptance criteria
RPD	Relative Percent Difference
Qual	Qualifers
-RE	Denotes sample was re-analyzed
D.F.	Dilution Factor. Please also see the Preparation Factor in the Analysis Summary section.
TIC	Tentatively Identified Compounds are compounds that are identified by comparing the analyte mass spectral pattern with the NIST spectral library. A TIC spectral match is reported when the pattern is at least 75% consistent with the published pattern. Compound concentrations are estimated and are calculated using an internal standard response factor of 1.
PCBs, Total	Total PCBs are defined as the sum of detected Aroclors 1016, 1221, 1232, 1248, 1254, 1260, 1262, and 1268.

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Chain of Custody
Form #: F1331
Rev. 2.0
Effective: Jun 28, 2016

CHAIN OF CUSTODY

COMPANY NAME: Virginia Institute of Marine Science	INVOICE TO: Virginia Institute of Marine Science	PROJECT NAME:
CONTACT: Donna Milligan	INVOICE CONTACT: Donna Milligan	SITE NAME:
ADDRESS: 1370 Greate Road, Gloucester, VA 23062	INVOICE ADDRESS:	PROJECT NUMBER: Shallow Water Dredging
PHONE #: 804-684-7596	INVOICE PHONE #:	P.O. #:
FAX #:	EMAIL: milligan@vims.edu	Pretreatment Program:
Is sample for compliance reporting? YES NO	Is sample from a chlorinated supply? YES NO	PWS I.D. #:
SAMPLER NAME (PRINT):	SAMPLER SIGNATURE:	Turn Around Time: Circle: 10 (5 Days) or __ Day(s)

Matrix Codes: WW=Waste Water/Storm Water GW=Ground Water DW=Drinking Water S=Soil/Solids OR=Organic A=Air WP=Wipe OT=Other_____

CLIENT SAMPLE I.D.	Grab	Composite	Field Filtered (Dissolved Metals)	Composite Start Date	Composite Start Time	Grab Date or Composite Stop Date	Grab Time or Composite Stop Time	Time Preserved	Matrix (See Codes)	Number of Containers	ANALYSIS / (PRESERVATIVE) Full TCLP	TPH-DRO SW 8015	MBTEX SW 8021	PCB SW 8082	Percent Solids			
1) Timberneck up creek	X			01/07	13:35				S		X	X	X	X	X			
2) Timberneck down creek	X			01/07	13:18				S		X	X	X	X	X			
3) Cedarbush up creek	X			01/07	13:01				S		X	X	X	X	X			
4) Cedarbush down creek	X			01/07	12:51				S		X	X	X	X	X			
5) Aberdeen up creek	X			01/07	12:27				S		X	X	X	X	X			
6) Aberdeen down creek	X			01/07	12:41				S		X	X	X	X	X			
7)																		
8)																		
9)																		
10)																		

COMMENTS

Preservative Codes: N=Nitric Acid C=Hydrochloric Acid S=Sulfuric Acid H=Sodium Hydroxide A=Ascorbic Acid Z=Zinc Acetate T=Sodium Thiosulfate M=Methanol

PLEASE NOTE PRESERVATIVE(S), INTERFERENCE CHECKS or PUMP RATE (L/min)

air ice
#297 no seals

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
[signature]	01/08/21 12:00	[signature]	1-8-21 12:00
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME

QC Data Package
Level III ☐
Level IV ☐

LAB USE ONLY **COOLER TEMP** 3.8 °C

21A0319

Virginia Institute o: 21A0319
Shallow Water Dredging
Recd: 01/08/2021 Due: 01/15/2021

v130325002

ENTHALPY ANALYTICAL
formerly Air, Water & Soil Laboratories

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:	January 15, 2021 16:14
		Project Number:	[none]
		Purchase Order:	PCO2632666
Submitted To:	Donna Milligan		
Client Site I.D.:	Shallow Water Dredging		

Sample Conditions Checklist

Samples Received at:	**3.80°C**
How were samples received?	Walk In
Were Custody Seals used? If so, were they received intact?	No
Are the custody papers filled out completely and correctly?	No
Do all bottle labels agree with custody papers?	No
Is the temperature blank or representative sample within acceptable limits or received on ice, and recently taken?	Yes
Are all samples within holding time for requested laboratory tests?	Yes
Is a sufficient amount of sample provided to perform the tests included?	Yes
Are all samples in appropriate containers for the analyses requested?	Yes
Were volatile organic containers received?	No
Are all volatile organic and TOX containers free of headspace?	NA
Is a trip blank provided for each VOC sample set? VOC sample sets include EPA8011, EPA504, EPA8260, EPA624, EPA8015 GRO, EPA8021, EPA524, and RSK-175.	NA
Are all samples received appropriately preserved? Note that metals containers do not require field preservation but lab preservation may delay analysis.	Yes

Work Order Comments

Sample 'Aberdeen down creek' logged with sample time of 12:41 per the COC instead of 12:11 per the bottle labels. Donna Milligan notified via email. RMF 1-8-21 14:38

Per email from Donna Milligan, sample 'Aberdeen down creek' logged with sample time of 12:11. RMF 1-8-21 15:48

Per Donna Milligan, only TCLP Pest, Herb, and Metals are to be analyzed (not full TCLP). KLC 1-11-2021.

Appendix E

Draft Joint Permit Application

STANDARD JOINT PERMIT APPLICATION

United States Army Corps of Engineers (USACE) - Norfolk District
803 Front Street, ATTN: CENAO-WR-R
Norfolk, Virginia 23510-1011
Phone: (757) 201-7652, Fax: (757) 201-7678
Website: http://www.nao.usace.army.mil/Missions/Regulatory.aspx

Virginia Marine Resources Commission (VMRC)
Habitat Management Division
380 Fenwick Road, Building 96
Fort Monroe, VA 23651
Phone: (757) 247-2200, Fax: (757) 247-8062
Website: http://www.mrc.virginia.gov/hmac/hmoverview.shtm

Virginia Department of Environmental Quality (DEQ)
Virginia Water Protection Permit Program
Post Office Box 1105
Richmond, Virginia 23218
Phone: (804) 698-4000
Websites: http://www.deq.virginia.gov/
http://www.deq.virginia.gov/Locations.aspx

The following instructions and information are designed to assist you in applying for permits from federal, state, and local regulatory agencies for work in waters and/or wetlands within the Commonwealth of Virginia. The intent is to provide general information on the permit process, not to act as a complete legal and technical reference. Refer to the applicable laws, regulations, and/or guidance materials of each agency for a complete understanding of each agency's application requirements.

JOINT PERMIT APPLICATION PROCESS

The Joint Permit Application (JPA) process and Standard JPA form are used by the United States Army Corps of Engineers (USACE), the Virginia Marine Resources Commission (VMRC), the Virginia Department of Environmental Quality (DEQ), and the Local Wetlands Boards (LWB) for permitting purposes involving water, wetlands, and dune/beach resources, including water supply and water withdrawals projects (as defined in DEQ Regulation 9 VAC 25-210).

The Tidewater Joint Permit Application form is used for proposed private or commercial aquaculture projects and most commercial and noncommercial projects in **tidal waters, tidal wetlands, and coastal primary sand dunes and beaches in Virginia** that require the review and/or authorization by the LWB, the VMRC, the DEQ, and/or the USACE. The Tidewater JPA may be downloaded from the same web page on which the Standard JPA is located: http://www.nao.usace.army.mil/Missions/Regulatory/JPA.aspx. *If using the Tidewater JPA, follow the instructions provided with that form.*

Please note that some health departments and local agencies, such as local building officials and erosion and sediment control authorities, do not use the Joint Permit Application process or forms and may have different informational requirements. The applicant is responsible for contacting these agencies for information regarding those permitting requirements.

REGULATORY AUTHORITIES OF PARTICIPATING AGENCIES: The USACE regulates activities in waters of the United States, including wetlands, under Section 404 of the Clean Water Act (33 U.S.C. §1344), Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. §403), and Section 103 of the Marine Protection Research and Sanctuaries Act of 1972 (33 U.S.C. §1413).

The VMRC regulates activities on state-owned submerged lands, tidal wetlands, and dunes/beaches under Code of Virginia Title 28.2, Chapters 12, 13, and 14.

The DEQ regulates activities in state surface waters and wetlands under Section 401 of the Clean Water Act (33 U.S.C. §1341), under State Water Control Law (Code of Virginia Title 62.1), and Virginia Administrative Code Regulations 9VAC25-210 et seq., 9VAC25-660 et seq., 9VAC25-670 et seq., 9VAC25-680 et seq., and 9VAC25-690 et seq.

The LWBs regulate activities in tidal wetlands and dunes/beaches under Code of Virginia Title 28.2, Chapters 13 and 14.

LOCAL WETLANDS BOARD CONTACT INFORMATION: Links to LWB information on the Web can be found at http://ccrm.vims.edu/permits_web/guidance/local_wetlands_boards.html.

USACE FIELD OFFICE INFORMATION AND DEQ REGIONAL OFFICE INFORMATION: Answers to technical questions and detailed information about specific aspects of the various permit programs may be obtained from the USACE field office in your project area (please refer to the Contact Information on the Regulatory web page at: http://www.nao.usace.army.mil/Missions/Regulatory.aspx or call 757-201-7652), or from the DEQ regional office in your project area (please refer to http://www.deq.virginia.gov/Locations.aspx or call 804-698-4000). Applicants may also seek assistance with completing the informational requirements and/or submittals from private consulting and/or engineering firms for hire.

CHESAPEAKE BAY PRESERVATION ACT INFORMATION: Development within the 84 Counties, Cities, and Towns of "Tidewater Virginia" (as defined in §62.1-44.15:68 of the Code of Virginia) is subject to the requirements of the Chesapeake Bay Preservation

Act. If your project is located in a Bay Act locality and will involve activities, including land disturbance or removal of vegetation, within a designated Resource Protection Area (RPA), these actions will require approval from your local government and completion of Appendix C. The individual localities, not the DEQ, USACE, or Local Wetlands Boards, are responsible for enforcing Bay Act requirements and, therefore, local approval for any activity in an RPA is not granted through this JPA process. Each Tidewater locality has adopted a program based on the Chesapeake Bay Preservation Act and the *Chesapeake Bay Preservation Area Designation & Management Regulations*.

The Act and regulations require Bay Act local governments to administer specific criteria for the use, development and redevelopment of land within locally designated Chesapeake Bay Preservation Areas. Since the requirements of the Bay Act may affect the ultimate design and construction of projects, applicants should contact their local government as early in the process as possible, in order to ensure that these requirements are considered early in the permitting process, and to avoid unnecessary and costly delays. Individual localities will request information regarding existing vegetation within the RPA as well as a description and site drawings of any proposed activity within the RPA. This information will be used by local staff charged with ensuring compliance with the Bay Act during the local approval process. Any use, development and redevelopment or land disturbance within the RPA must receive local approval PRIOR to the initiation of any land disturbance.

To determine if your project is located in a Bay Act locality (see map on page 31 or http://www.deq.virginia.gov/Programs/Water/ChesapeakeBay/ChesapeakeBayPreservationAct/LocalGovernmentOrdinances.aspx), learn more about Bay Act requirements, or find local government contacts, please visit the Virginia Department of Environmental Quality at http://www.deq.virginia.gov/Programs/Water/ChesapeakeBay/ChesapeakeBayPreservationAct.aspx.

HOW TO APPLY

Sections A through D below provide a general list of information and drawings that are required, depending on the type of project being proposed. Prepare all required drawings or sketches as detailed in the lists provided in Appendix D (Drawings) and according to the sample drawings provided in Appendix D.

Application materials should be submitted to VMRC:

1. ***If by mail or courier, use the address on page 1.***
2. ***If by electronic mail, address the package to: JPA.permits@mrc.virginia.gov. The application must be provided in the .pdf format.***

When completing this form, use the legal name of the applicant, agent, and/or property owner. For DEQ application purposes, *legal name* means the full legal name of an individual, business, or other organization. For an individual, the legal name is the first name, middle initial, last name, and suffix. For an entity authorized to do business in Virginia, the legal name is the exact name set forth in the entity's articles of incorporation, organization or trust, or formation agreement, as applicable. Also provide the name registered with the State Corporation Commission, if required to register. DEQ issues a permit or grants coverage to the so-named individual or business, who becomes the 'permittee'. Correspondence from some agencies, including permits, authorizations, and/or coverage, may be provided via electronic mail. If the applicant and/or agent wish(es) to receive their permit via electronic mail, please remember to include an e-mail address at the requested place in the application.

A. APPLICATIONS FOR PROJECTS INVOLVING IMPACTS TO *TIDAL* WATERS, WETLANDS, AND DUNES/BEACHES (INCLUDING SHORELINE STABILIZATION, PIERS, MARINAS, BEACH NOURISHMENT, BOATHOUSES, BOAT LIFTS, BREAKWATERS, AQUACULTURE ACTIVITIES, DREDGING, ETC.) SHOULD INCLUDE THE FOLLOWING:

- ❖ All *applicable* portions of Sections 1 through 26 of the JPA, including necessary attachments, information required for projects located in CBPA localities as required in Appendix C (a map of CBPA localities can be found on page 31).
- ❖ Adjacent Property Owner's Acknowledgement Forms(1), as detailed in Appendix A or the name and address of the adjacent landowners.
- ❖ An analysis of the functions of wetlands proposed to be impacted may be required by DEQ. (3).
- ❖ A set of 8 ½ x 11 inch drawings. If you cannot include all of your project site on one page at a scale no smaller than 1" = 200', you **must** submit a set of 8 ½ x 11 inch match-line drawings **and** a set of large-sized drawings at a scale no smaller than 1"= 200'. If oversized drawings are used, attach **five** copies of the oversized drawings to your application.
- ❖ In order for projects requiring LWB authorization to be considered complete, applications must include the following information (per Virginia Code 28.2-1302): *"The permit application shall include the following: the name and address of the applicant; a detailed description of the proposed activities; a map, drawn to an appropriate and uniform scale, showing the area of wetlands directly affected, the location of the proposed work thereon, the area of existing and proposed fill and excavation, the location, width, depth and length of any proposed channel and disposal area, and the location of all existing and proposed structures, sewage collection and treatment facilities, utility installations, roadways, and other related appurtenances of facilities, including those on the adjacent uplands; a description of the type of equipment to be used and the means of access to the activity site; the names and addresses of record of adjacent land and known claimants of water rights in or adjacent to the wetland of whom the applicant has notice; an estimate of cost; the primary purpose of the project; and secondary purpose of the proposed project; a complete description of measures to be taken during and after alteration to reduce detrimental offsite effects; the completion date of the proposed work, project, or structure; and such additional materials and documentation as the wetlands board may require."*

B. APPLICATIONS FOR PROJECTS INVOLVING IMPACTS TO *NONTIDAL* WATERS AND/OR WETLANDS *AND*:

1) **WHERE AUTHORIZATION UNDER *STATE PROGRAM GENERAL PERMIT (SPGP)* IS REQUESTED:**

Programmatic general permits may be issued by the USACE in situations where a state, regional, or local authority has a regulatory program in place that provides similar review and regulation of activities in waters as does the USACE. In such cases, the programmatic general permit allows the state, region, or locality to provide the federal authorization, thus avoiding unnecessary duplication of effort by multiple regulatory authorities. In Virginia, DEQ provides authorization for certain activities regulated by the USACE through the State Program General Permit (SPGP). DEQ's authorization under the SPGP is a separate action from that providing coverage under any Virginia Water Protection permit. Certain Residential/Commercial/Institutional Development activities and Linear Transportation activities will be considered for coverage under the current SPGP. Details about the current SPGP can be found at http://www.nao.usace.army.mil/Missions/Regulatory/RBregional.aspx.

- ❖ Mark the "SPGP" checkbox on page 7 of this application.
- ❖ All *applicable* portions of Sections 1 through 26 of the JPA, including necessary attachments.
- ❖ A conceptual compensatory mitigation plan(2).
- ❖ A copy of the confirmed jurisdictional determination or confirmed delineation, including a waters and wetlands boundary map and data sheets(3).
- ❖ All information required for projects located in CBPA localities as required in Appendix C (a map of CBPA localities can be found on page 31).
- ❖ A copy of the FEMA flood insurance rate map or FEMA-approved local floodplain map for the project site (not applicable to <0.1 acre and < 300 linear feet projects by either USACE or DEQ).
- ❖ A set of 8 ½ x 11 inch drawings. If you cannot include all of your project site on one page at a scale no smaller than 1" = 200', you **must** submit a set of 8 ½ x 11 inch match-line drawings **and** a set of large-sized drawings at a scale no smaller than 1"= 200'. If oversized drawings are used, attach **five** copies of the oversized drawings to your application.

2) **WHERE NO SPGP IS REQUESTED:**

- ❖ All *applicable* portions of Sections 1 through 26 of the JPA, including necessary attachments.
- ❖ A conceptual compensatory mitigation plan(2).
- ❖ A copy of the confirmed jurisdictional determination or confirmed delineation, including a waters and wetlands boundary map and data sheets(3).
- ❖ All information required for projects located in CBPA localities as required in Appendix C (a map of CBPA localities can be found on page 31), and a copy of the FEMA flood insurance rate map or FEMA-approved local floodplain map for the project site.
- ❖ An analysis of the functions of wetlands proposed to be impacted may be required by DEQ (4).
- ❖ A set of 8 ½ x 11 inch drawings. If you cannot include all of your project site on one page at a scale no smaller than 1" = 200', you **must** submit a set of 8 ½ x 11 inch match-line drawings **and** a set of large-sized drawings at a scale no smaller than 1"= 200'. If oversized drawings are used, attach **five** copies of the oversized drawings to your application.

C. APPLICATIONS FOR PROJECTS INVOLVING SURFACE WATER WITHDRAWALS or FERC LICENSE OR RELICENSE ASSOCIATED WITH A SURFACE WATER WITHDRAWAL:

- ❖ Mark the "DEQ Reapplication" checkbox on page 7 of this application and provide the current/existing permit number.
- ❖ All *applicable* portions of Sections 1 through 26 of the JPA, including necessary attachments.
- ❖ All *applicable* portions of Part A and B above if the project involves wetland and/or stream impacts.
- ❖ Copy of any pre-application review panel documentation and summary of the issues raised
- ❖ For new or expanded surface water withdrawals proposing to withdraw 90 million gallons a month or greater, a summary of the steps taken to seek public input as required by 9VAC25-210-320 and an identification of the issues raised during the course of the public information meeting process.

D. ANY APPLICATIONS USING THE JPA FORM AS A PRE-CONSTRUCTION NOTIFICATION (PCN) FOR A USACE NATIONWIDE PERMIT:

- ❖ Mark the "PCN" checkbox on page 7 of this application and insert the number of the intended Nationwide permit. If you fail to mark this box, the PCN will be deemed incomplete and the USACE 45-day time clock will not start.
- ❖ All *applicable* portions of Sections 1 through 26 of the JPA, including necessary attachments and all information required for projects located in CBPA localities as required in Appendix C (a map of CBPA localities can be found on page 31).
- ❖ A set of 8 ½ x 11 inch drawings. If you cannot include all of your project site on one page at a scale no smaller than 1" = 200', you **must** submit a set of 8 ½ x 11 inch match-line drawings **and** a set of large-sized drawings at a scale no smaller than 1"= 200'. If oversized drawings are used, attach **five** copies of the oversized drawings to your application.

WHAT HAPPENS NEXT

Upon receipt of an application, VMRC will assign a permit application number to the JPA and will then distribute a copy of the application and any plan copies submitted to the other regulatory agencies that are involved in the JPA process. All agencies will conduct separate but concurrent reviews of your project. Please be aware that each agency must issue a separate permit (or a notification that no permit is required). Note that in some cases, DEQ may be taking an action on behalf of the USACE, such as when the State Program General Permit (SPGP) applies. Make sure that you have received all necessary authorizations, or documentation that no permit is required, from each agency prior to beginning the proposed work.

During the JPA review process, site inspections may be necessary to evaluate a proposed project. Failure to allow an authorized representative of a regulatory agency to enter the property, or to take photographs of conditions at the project site, may result in either the withdrawal or denial of your permit application.

For certain federal and state permit applications, a public notice is published in a newspaper having circulation in the project area, is mailed to adjacent and/or riparian property owners, and/or is posted on the agency's web page. The public may comment on the project during a designated comment period, if applicable, which varies depending upon the type of permit being applied for and the issuing agency. In certain circumstances, the project may be heard by a governing board, such as a Local Wetlands Board, the State Water Control Board, or VMRC in cases where a locality does not have a wetlands board. You may be responsible for bearing the costs for advertisement of public notices.

Public hearings that are held by VMRC occur at their regularly scheduled monthly commission meetings under the following situations: Protested applications for VMRC permits which cannot be resolved; projects costing over $500,000 involving encroachment over state-owned subaqueous land; and all projects affecting tidal wetlands and dunes/beaches in localities without a LWB. All interested parties will be officially notified regarding the date and time of the hearing and Commission meeting procedures. The Commission will usually make a decision on the project at the meeting unless a decision for continuance is made. If a proposed project is approved, a permit or similar agency correspondence is sent to the applicant. In some cases, notarized signatures, as well as processing fees and royalties, are required before the permit is validated. If the project is denied, the applicant will be notified in writing.

PERMIT APPLICATION OR OTHER FEES

DO NOT send any fees with the JPA. *VMRC is not responsible for accounting for fees required by other agencies.* Please consult agency websites or contact agencies directly for current fee information and submittal instructions.

- USACE: Permit application fees are required for USACE Individual (Standard) permits. A USACE project manager will contact you regarding the proper fee and submittal requirements.
- DEQ: Permit application fees required for Virginia Water Protection permits – while detailed in 9VAC25-20 – are conveyed to the applicant by the applicable DEQ office (http://www.deq.virginia.gov/Locations.aspx). Complete the Permit Application Fee Form and submit it per the instructions listed on the form. Instructions for submitting any other fees will be provided to the applicant by DEQ staff.
- VMRC: An application fee of $300 may be required for projects impacting tidal wetlands, beaches and/or dunes when VMRC acts as the LWB. VMRC will notify the applicant in writing if the fee is required. Permit fees involving subaqueous lands are $25.00 for projects costing $10,000 or less and $100 for projects costing more than $10,000. Royalties may also be required for some projects. The proper permit fee and any required royalty is paid at the time of permit issuance by VMRC. VMRC staff will send the permittee a letter notifying him/her of the proper permit fees and submittal requirements.
- LWB: Permit fees vary by locality. Contact the LWB for your project area or their locality website for fee information and submittal requirements. Contact information for LWB may be found at http://ccrm.vims.edu/permits_web/guidance/local_wetlands_boards.html.

INFORMATION REGARDING THREATENED OR ENDANGERED SPECIES

In order to find preliminary information regarding federal or state threatened or endangered species on your project site, you may contact the following four agencies:

United States Fish and Wildlife Service 6669 Short Lane Gloucester, Virginia 23061 Voice: (804) 693-6694 Fax: (804) 693-9032 http://virginiafieldoffice.fws.gov/	NOAA Fisheries Greater Atlantic Region Fisheries Office National Marine Fisheries Service 55 Great Republic Drive Gloucester, MA 01930 Voice: (978) 281-9300 https://www.greateratlantic.fisheries.noaa.gov/contact_us/index.html
Project Review Coordinator Virginia Department of Conservation and Recreation Natural Heritage Division 217 Governor Street Richmond, Virginia 23219 Voice: (804) 786-7951 Fax: (804) 371-2674 http://www.dcr.virginia.gov/natural_heritage/index.shtml	Virginia Department of Game and Inland Fisheries Environmental Services Section 4010 West Broad Street Richmond, Virginia 23230-1104 (804) 367-1000 http://www.dgif.virginia.gov/wildlife/

INFORMATION REGARDING FEMA-MAPPED FLOODPLAINS

You may obtain "Online Hazard Maps" for FEMA-mapped floodplains by visiting https://hazards.fema.gov/femaportal/wps/portal. Local governments also keep paper copies of FEMA maps on hand.

FOOTNOTES

(1) Adjacent Property Owner Notification: When determining whether to grant or deny any permit for the use of state-owned submerged lands, the VMRC must consider, among other things, effects of a proposed project on adjacent or nearby properties. Discussing the proposed project with these property owners can be done on your own using the forms in Appendix A of this package. Local Wetlands Boards (LWB) must also consider the effects on adjacent properties and notify adjoining property owners of the required public hearings for all applications. The completed forms will assist VMRC and LWB in processing the application. The forms in Appendix A may be photocopied if more copies are needed. This information will not be used by DEQ to meet the requirements of notifying riparian land owners.

(2) Compensatory mitigation plans. Conceptual compensatory mitigation plans, when required, should include all information stipulated in Sections 80 B and 116 F of DEQ Regulation 9VAC25-210 for Virginia Water Protection individual permit applicants, or in Sections 60 B and/or 70 of DEQ Regulations 9VAC25-660, 9VAC25-670, 9VAC25-680, or 9VAC25-690 for Virginia Water Protection general permit coverage applicants. Regulations may be obtained from DEQ's web site at http://www.deq.virginia.gov/Programs/Water/WetlandsStreams.aspx. Information on wetland and stream compensatory mitigation is available at http://www.deq.virginia.gov/Programs/Water/WetlandsStreams/Mitigation.aspx. The SPGP applicant is required to provide a conceptual mitigation plan in accordance with the current SPGP (http://www.nao.usace.army.mil/Missions/Regulatory/RBregional.aspx). ***Final*** compensatory mitigation plans will be required *prior to commencement of impacts to waters and/or wetlands* on your project site. If no mitigation is planned, submit a detailed statement as to why no mitigation is planned. For projects requiring a LWB or VMRC tidal wetlands permit, please consult the VMRC Wetlands Mitigation-Compensation Policy and Supplemental Guidelines: 4 VAC 20-390 at http://www.mrc.virginia.gov/regulations/regindex.shtm.

(3) Wetland and waters boundary delineation map: Wetlands/waters delineations must be performed using the USACE "Wetland Delineation Manual, Technical Report Y-87-1, January 1987, Final Report" (Federal Manual) and if applicable, the current version of the Regional Supplement to the Corps of Engineers Wetlands Delineation Manual (Atlantic and Gulf Coastal Plain Region or Eastern Mountains and Piedmont Region. The SPGP applicant is required to provide a Corps-confirmed jurisdictional determination or Corps-confirmed delineation approved for use with a permit application, in accordance with the current SPGP (http://www.nao.usace.army.mil/Missions/Regulatory/RBregional.aspx). Contact the appropriate USACE District office or field office to obtain a delineation confirmation by referencing the Contact Information on the Regulatory web page at: http://www.nao.usace.army.mil/Missions/Regulatory.aspx or call the Regulator of the Day (ROD) at 757-201-7652. If a USACE confirmation is not available at the time of application, it must be submitted as soon as it becomes available during the DEQ permit review. For DEQ application purposes, the requirements for delineations apply to all applications, regardless of the amount of impacts. The information to be submitted is detailed in 9VAC25-210-80 B 1 h and is the same regardless of the type of VWP permit being sought.

(4) An analysis of the functions of wetlands, when required for DEQ permitting purposes, shall assess water quality or habitat metrics and shall be coordinated with DEQ in advance of conducting the analysis. For DEQ permitting purposes, please refer to the requirements in 9VAC25-210-80 C, which are the same regardless of the type of VWP permit being sought.

TABLE OF CONTENTS

FOR AGENCY USE ONLY	
	Notes:
JPA#	

APPLICANTS

PLEASE PRINT OR TYPE ALL ANSWERS. If a question does not apply to your project, please print N/A (not applicable) in the space provided. ***If additional space is needed, attach extra 8 ½ x 11 inch sheets of paper.***

Check all that apply			
☐ Pre-Construction Notification (PCN) ☐ NWP # _____ ☐ RP # 05 (*For NWPs & RP 05 ONLY - No DEQ-VWP permit writer will be assigned*)	☐ SPGP	☐ DEQ Reapplication Existing permit number: _____	☐ Receiving federal funds Agency providing funding: _____
☐ Regional Permit 17 Checklist (RP-17)			

PREVIOUS ACTIONS RELATED TO THE PROPOSED WORK (Include all federal, state, and local pre application coordination, site visits, previous permits, or applications whether issued, withdrawn, or denied)

Historical information for past permit submittals can be found online with VMRC - https://webapps.mrc.virginia.gov/public/habitat/ - or VIMS - http://ccrm.vims.edu/perms/newpermits.html

Agency	Action / Activity	Permit/Project number, including any non-reporting Nationwide permits previously used (e.g., NWP 13)	Date of Action	If denied, give reason for denial

1. APPLICANT, AGENT, PROPERTY OWNER, AND CONTRACTOR INFORMATION
The applicant(s) is/are the legal entity to which the permit may be issued (see How to Apply at beginning of form). The applicant(s) can either be the property owner(s) or the person/people/company(ies) that intend(s) to undertake the activity. The agent is the person or company that is representing the applicant(s). If a company, please also provide the company name that is registered with the State Corporation Commission (SCC), or indicate no registration with the SCC.

Legal Name(s) of Applicant(s)			Agent (if applicable)		
Mailing address			Mailing address		
City	State	ZIP Code	City	State	ZIP Code
Phone number w/area code	Fax		Phone number w/area code	Fax	
Mobile	E-mail		Mobile	E-mail	
State Corporation Commission Name and ID number (if applicable)			State Corporation Commission Name and ID number (if applicable)		

Certain permits or permit authorizations may be provided via electronic mail. If the applicant wishes to receive their permit via electronic mail, please provide an e-mail address here: _____

1. APPLICANT, AGENT, PROPERTY OWNER, AND CONTRACTOR INFORMATION (Continued)

Property owner(s) legal name, if different from applicant			Contractor, if known		
Mailing address			Mailing address		
City	State	ZIP code	City	State	ZIP code
Phone number w/area code	Fax		Phone number w/area code	Fax	
Mobile	E-mail		Mobile	E-mail	
State Corporation Commission Name and ID number (if applicable)			State Corporation Commission Name ID number (if applicable)		

2. PROJECT LOCATION INFORMATION

(Attach a copy of a detailed map, such as a USGS topographic map or street map showing the site location and project boundary, so that it may be located for inspection. Include an arrow indicating the north direction. Include the drainage area if the SPGP box is checked on Page 7.)

Street Address (911 address if available)	City/County/ZIP Code Gloucester County
Subdivision	Lot/Block/Parcel #

Name of water body(ies) within project boundaries and drainage area (acres or square miles).
Cedarbush Creek and York River

Tributary(ies) to: Cedarbush Creek/York River/Chesapeake Bay
Basin: York River Sub-basin: Lower York
(*Example: Basin: James River Sub-basin: Middle James River*)

Special Standards (based on DEQ Water Quality Standards 9VAC25-260 et seq.): _____

Project type (check one)
_____ Single user (private, non-commercial, residential)
X Multi-user (community, commercial, industrial, government)
_____ Surface water withdrawal

Latitude and longitude at center of project site (decimal degrees): 37.309214 / -76.559235
(Example: 37.33164/-77.68200)

USGS topographic map name: Claybank

8-digit USGS Hydrologic Unit Code (HUC) for your project site (See http://cfpub.epa.gov/surf/locate/index.cfm): 02080107
If known, indicate the 10-digit and 12-digit USGS HUCs (see http://consapps.dcr.virginia.gov/htdocs/maps/HUExplorer.htm) : _____ 020801070203

Name of your project (*Example: Water Creek driveway crossing*) Cedarbush Creek Channel

Is there an access road to the project? ☑ Yes ☐ No. If yes, check all that apply: ☑ public ☐ private ☐ improved ☐ unimproved

Total size of the project area (in acres): 35 acres (17 acres channel and 18 acre disposal site)

2. PROJECT LOCATION INFORMATION (Continued)

Provide driving directions to your site, giving distances from the best and nearest visible landmarks or major intersections:

Take Rt 17 North from the Coleman Bridge to Rt. 636, Providence Rd. Turn left onto Rt. 636. Travel 2.8 miles to Rt. 633. Turn left onto Rt. 633. Travel about 2 miles to the end of Rt. 633. You have arrived at Cedarbush Creek.

Does your project site cross boundaries of two or more localities (i.e., cities/counties/towns)? ☐ Yes ☑ No
If so, name those localities:

3. DESCRIPTION OF THE PROJECT, PROJECT PRIMARY AND SECONDARY *PURPOSES*, PROJECT *NEED*, INTENDED USE(S), AND ALTERNATIVES CONSIDERED (Attach additional sheets if necessary)

- The purpose and need must include any new development or expansion of an existing land use and/or proposed future use of residual land.
- Describe the physical alteration of surface waters, including the use of pilings (#, materials), vibratory hammers, explosives, and hydraulic dredging, when applicable, and *whether or not tree clearing will occur* (include the area in square feet and time of year).
- Include a description of alternatives considered and measures taken to avoid or minimize impacts to surface waters, including wetlands, to the maximum extent practicable. Include factors such as, but not limited to, alternative construction technologies, alternative project layout and design, alternative locations, local land use regulations, and existing infrastructure
- For utility crossings, include both alternative routes and alternative construction methodologies considered
- For surface water withdrawals, public surface water supply withdrawals, or projects that will alter in stream flows, include the water supply issues that form the basis of the proposed project.

This project consists of new dredging at Cedarbush Creek with dredged material placement upland at Dept of Conservation and Recreation property 2.5 miles upriver adjacent to Aberdeen Creek. Dredging of Cedarbush Creek is necessary to allow safe navigation for vessels utilizing the working waterfront located on the creek and private boat slips farther up the creek. The channel design used the federally-authorized channel at Aberdeen Creek as guidance to determine the parameters that best fit this section of the York River. The channel will be dredged to a maximum depth of -7 ft MLLW including allowable overdepth and non-pay depth. The Cedarbush channel is 9,000 ft long and 80 ft wide with a proposed offshoot and turning basin that extends to the pier at Oliver's Landing. Approximately 105,000 cy of material will be dredged. Dredged material placement will occur at an upland disposal site using Geotubes for containment.

Date of proposed commencement of work (MM/DD/YYYY)	Date of proposed completion of work (MM/DD/YYYY)
_____	_____
Are you submitting this application at the direction of any state, local, or federal agency? _____Yes _____No	Has any work commenced or has any portion of the project for which you are seeking a permit been completed? _____ Yes __X___ No

If you answered "yes" to either question above, give details stating when the work was completed and/or when it commenced, who performed the work, and which agency (if any) directed you to submit this application. In addition, you will need to clearly differentiate between completed work and proposed work on your project drawings.

Are you aware of any unresolved violations of environmental law or litigation involving the property? _____Yes __X__No
(If yes, please explain)

4. PROJECT COSTS

Approximate cost of the entire project, including materials and labor: $_____
Approximate cost of only the portion of the project affecting state waters (channelward of mean low water in tidal areas and below ordinary high water mark in nontidal areas): $ _____

5. PUBLIC NOTIFICATION (Attach additional sheets if necessary)

Complete information for all property owners adjacent to the project site and across the waterway, if the waterway is less than 500 feet in width. If your project is located within a cove, you will need to provide names and mailing addresses for all property owners within the cove. If you own the adjacent lot, provide the requested information for the first adjacent parcel beyond your property line. Per Army Regulation (AR 25-51) outgoing correspondence must be addressed to a person or business.

Failure to provide this information may result in a delay in the processing of your application by VMRC.

Property owner's name	Mailing address	City	State	ZIP code
Catesby Jones	P.O. Box 137	White Marsh	VA	23183
Corinne Gentle	P.O. Box 913	Hayes	VA	23072

Name of newspaper having general circulation in the area of the project: Gloucester-Mathews Gazette-Journal

Address and phone number (including area code) of newspaper P.O. Box 2060 Gloucester, VA, 23061 Phone: 804-693-3101

Have adjacent property owners been notified with forms in Appendix A? _____Yes X____No (attach copies of distributed forms)

6. THREATENED AND ENDANGERED SPECIES INFORMATION

Please provide any information concerning the potential for your project to impact state and/or federally threatened and endangered species (listed or proposed). Attach correspondence from agencies and/or reference materials that address potential impacts, such as database search results or confirmed waters and wetlands delineation/jurisdictional determination. Include information when applicable regarding the location of the project in Endangered Species Act-designated or -critical habitats. Contact information for the U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration, Virginia Dept. of Game and Inland Fisheries, and the Virginia Dept. of Conservation and Recreation-Division of Natural Heritage can be found on page 4 of this package.

7. HISTORIC RESOURCES INFORMATION

Note: Historic properties include but are not limited to archeological sites, battlefields, Civil War earthworks, graveyards, buildings, bridges, canals, etc. Prospective permittees should be aware that section 110k of the NHPA (16 U.S.C. 470h-2(k)) prevents the USACE from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of Section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the USACE, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant.

Are any historic properties located within or adjacent to the project site? ____ Yes X___ No _____ Uncertain
If Yes, please provide a map showing the location of the historic property within or adjacent to the project site.

Are there any buildings or structures 50 years old or older located on the project site? ____ Yes X___ No _____ Uncertain
If Yes, please provide a map showing the location of these buildings or structures on the project site.

Is your project located within a historic district? ____ Yes X___ No ____ Uncertain

If Yes, please indicate which district: _____

7. HISTORIC RESOURCES INFORMATION (Continued)

Has a survey to locate archeological sites and/or historic structures been carried out on the property?
___ Yes _x__ No ___ Uncertain

If Yes, please provide the following information: Date of Survey: _____

Name of firm: _____

Is there a report on file with the Virginia Department of Historic Resources? ____ Yes ____X___ No ___Uncertain

Title of Cultural Resources Management (CRM) report: _____

Was any historic property located? ____ Yes ____ No __ Uncertain

8. WETLANDS, WATERS, AND DUNES/BEACHES IMPACT INFORMATION

Report each impact site in a separate column. If needed, attach additional sheets using a similar table format. Please ensure that the associated project drawings clearly depict the location and footprint of each numbered impact site. For dredging, mining, and excavating projects, use Section 17.

	Impact site number 1	Impact site number 2	Impact site number 3	Impact site number 4	Impact site number 5
Impact description (use all that apply): F=fill EX=excavation S=Structure T=tidal NT=non-tidal TE=temporary PE=permanent PR=perennial IN=intermittent SB=subaqueous bottom DB=dune/beach IS=hydrologically isolated V=vegetated NV=non-vegetated MC=Mechanized Clearing of PFO (*Example: F, NT, PE, V)*	Channel Dredging EX, T, PE, SB	Upland Disposal Site F			
Latitude / Longitude (in decimal degrees)	37.309214, -76.559235	37.297926, -76.537382			
Wetland/waters impact area (square feet / acres)	740,520sqft/17 acres				
Dune/beach impact area (square feet)					
Stream dimensions at impact site (length and average width in linear feet, and area in square feet)	Tidal				
Volume of fill below Mean High Water or Ordinary High Water (cubic yards)					

8. WETLANDS/WATERS IMPACT INFORMATION (Continued)					
Cowardin classification of impacted wetland/water or geomorphological classification of stream *Example wetland: PFO; Example stream: 'C' channel and if tidal, whether vegetated or non-vegetated wetlands per Section 28.2-1300 of the Code of Virginia*	E1UBL				
Average stream flow at site (flow rate under normal rainfall conditions in cubic feet per second) and method of deriving it (gage, estimate, etc.)	Tidal				
Contributing drainage area in acres or square miles (*VMRC cannot complete review without this information*)	< 5 sq miles				
DEQ classification of impacted resource(s): Estuarine Class II Non-tidal waters Class III Mountainous zone waters Class IV Stockable trout waters Class V Natural trout waters Class VI Wetlands Class VII https://law.lis.virginia.gov	Estuarine Class II				
For DEQ permitting purposes, also submit as part of this section a wetland and waters boundary delineation map – see (3) in the Footnotes section in the form instructions.					
For DEQ permitting purposes, also submit as part of this section a written disclosure of all wetlands, open water, or streams that are located within the proposed project or compensation areas that are also under a deed restriction, conservation easement, restrictive covenant, or other land-use protective instrument.					

9. APPLICANT, AGENT, PROPERTY OWNER, AND CONTRACTOR CERTIFICATIONS

READ ALL OF THE FOLLOWING CAREFULLY BEFORE SIGNING

PRIVACY ACT STATEMENT: The Department of the Army permit program is authorized by Section 10 of the Rivers and Harbors Act of 1899, Section 404 of the Clean Water Act, and Section 103 of the Marine Protection Research and Sanctuaries Act of 1972. These laws require that individuals obtain permits that authorize structures and work in or affecting navigable waters of the United States, the discharge of dredged or fill material into waters of the United States, and the transportation of dredged material for the purpose of dumping it into ocean waters prior to undertaking the activity. Information provided in the Joint Permit Application will be used in the permit review process and is a matter of public record once the application is filed. Disclosure of the requested information is voluntary, but it may not be possible to evaluate the permit application or to issue a permit if the information requested is not provided.

CERTIFICATION: I am hereby applying for permits typically issued by the DEQ, VMRC, USACE, and/or Local Wetlands Boards for the activities I have described herein. I agree to allow the duly authorized representatives of any regulatory or advisory agency to enter upon the premises of the project site at reasonable times to inspect and photograph site conditions, both in reviewing a proposal to issue a permit and after permit issuance to determine compliance with the permit.

In addition, I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

9. APPLICANT, AGENT, PROPERTY OWNER, AND CONTRACTOR CERTIFICATIONS (Continued)

Is/Are the Applicant(s) and Owner(s) the same? ☐ *Yes* ☐ *No*

Legal name & title of Applicant	Second applicant's legal name & title, if applicable
Applicant's signature	Second applicant's signature
Date	Date
Property owner's legal name, if different from Applicant	Second property owner's legal name, if applicable
Property owner's signature, if different from Applicant	Second property owner's signature
Date	Date

CERTIFICATION OF AUTHORIZATION TO ALLOW AGENT(S) TO ACT ON APPLICANT'S(S') BEHALF (IF APPLICABLE)

I (we), _____ (and) _____ ,
APPLICANT'S LEGAL NAME(S) – *complete the second blank if more than one Applicant*

hereby certify that I (we) have authorized _____ (and) _____
AGENT'S NAME(S) – *complete the second blank if more than one Agent*
to act on my (our) behalf and take all actions necessary to the processing, issuance, and acceptance of this permit and any and all standard and special conditions attached. I (we) hereby certify that the information submitted in this application is true and accurate to the best of my (our) knowledge.

Applicant's signature	Second applicant's signature, if applicable
Date	Date
Agent's signature and title	Second agent's signature and title, if applicable
Date	Date

CONTRACTOR ACKNOWLEDGEMENT (IF APPLICABLE)

I (we), _____ (and) _____ ,
APPLICANT'S LEGAL NAME(S) – *complete the second blank if more than one Applicant*

have contracted _____ (and) _____
CONTRACTOR'S NAME(S) – *complete the second blank if more than one Contractor*

to perform the work described in this Joint Permit Application, signed and dated _____.

I (we) will read and abide by all conditions as set forth in all federal, state, and local permits as required for this project. I (we) understand that failure to follow the conditions of the permits may constitute a violation of applicable federal, state, and local statutes and that we will be liable for any civil and/or criminal penalties imposed by these statutes.
In addition, I (we) agree to make available a copy of any permit to any regulatory representative visiting the project site to ensure permit compliance. If I (we) fail to provide the applicable permit upon request, I (we) understand that the representative will have the option of stopping our operation until it has been determined that we have a properly signed and executed permit and are in full compliance with all of the terms and conditions.

Contractor's name or name of firm (printed/typed)	Contractor's or firm's mailing address	
Contractor's signature and title	Contractor's license number	Date
Applicant's signature	Second applicant's signature, if applicable	
Date	Date	

16. BEACH NOURISHMENT (Continued)

Describe the type(s) of vegetation proposed for stabilization and the proposed planting plan, including schedule, spacing, monitoring, etc. Attach additional sheets if necessary.

17. DREDGING, MINING, AND EXCAVATING

FILL OUT THE FOLLOWING TABLE FOR DREDGING PROJECTS

	NEW dredging				**MAINTENANCE dredging**			
	Hydraulic		Mechanical (clamshell, dragline, etc.)		Hydraulic		Mechanical (clamshell, dragline, etc.)	
	Cubic yards	Square feet	Cubic yards	Square feet	Cubic yards	Square feet	Cubic yards	Square feet
Vegetated wetlands								
Non-vegetated wetlands								
Subaqueous land	105,000	2,835,000						
Totals	105,000	2,835,000						

Is this a one-time dredging event? [X] Yes _____ No If "no", how many dredging cycles are anticipated: _____
(____ initial cycle in cu. yds.) (_____ subsequent cycles in cu. yds.)

Composition of material (percentage sand, silt, clay, rock):
Provide documentation (i.e., laboratory results or analytical reports) that *dredged* material from on-site areas is free of toxics. If not free of toxics, provide documentation of proper disposal (i.e., bill of lading from commercial supplier or disposal site).

Cedarbush Creek is a small tributary to the York River in rural Gloucester County far removed from the sources of industrial contamination. Dredge material is relatively recently shoaled sediments migrating through the littoral system. Tests from samples indicated no contamination from common contaminants.

Please include a dredged material management plan that includes specifics on how the dredged material will be handled and retained to prevent its entry into surface waters or wetlands. If on-site dewatering is proposed, please include plan view and cross-sectional drawings of the dewatering area and associated outfall.

Dredged material will be placed in Geotubes. In addition, silt fencing will be used to prevent dredged material entrance to surface waters while drying.

Will the dredged material be used for any commercial purpose or beneficial use? _____Yes _x_____No
If yes, please explain:

If this is a maintenance dredging project, what was the date that the dredging was last performed? _____
Permit number of original permit: _____ *(It is important that you attach a copy of the original permit.)*

17. DREDGING, MINING, AND EXCAVATING (Continued)

For mining projects: On separate sheets of paper, explain the operation plans, including: 1) the frequency (e.g., every six weeks), duration (i.e., April through September), and volume (in cubic yards) to be removed per operation; 2) the temporary storage and handling methods of mined material, including the dimensions of the containment berm used for upland disposal of dredged material and the need (or no need) for a liner or impermeable material to prevent the leaching of any identified contaminants into ground water; 3) how equipment will access the mine site; and 4) verification that dredging: a) will not occur in water body segments that are currently on the effective Section 303(d) Total Maximum Daily Load (TMDL) priority list (available at http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/TMDL/TMDLDevelopment/TMDLProgramPriorities.aspx) or that have an approved TMDL; b) will not exacerbate any impairment; and c) will be consistent with any waste load allocation/limit/conditions imposed by an approved TMDL (see, "What's in my backyard" or subsequent spatial files at http://www.deq.virginia.gov/ConnectWithDEQ/VEGIS.aspx to determine the extent of TMDL watersheds and impairment segments).

Have you applied for a permit from the Virginia Department of Mines, Minerals and Energy? _____Yes _x_____No If Yes:
Existing permit number:_____ Date permit issued: _____

Contributing drainage area: _____square miles	Average stream flow at site (flow rate under normal rainfall conditions): _____cfs

18. FILL (not associated with backfilled shoreline structures) AND OTHER STRUCTURES (other than piers and boathouses) IN WETLANDS OR WATERS, OR ON DUNES/BEACHES

Source and composition of fill material (percentage sand, silt, clay, rock):

_____

Provide documentation (i.e., laboratory results or analytical reports) that *fill* material from *off-site* locations is free of toxics. If not free of toxics, provide documentation of proper disposal (i.e., bill of lading from commercial supplier or disposal site). Documentation is not necessary for fill material obtained from on-site areas.

Explain the purpose of the filling activity and the type of structure to be constructed over the filled area (if any):

Describe any structure that will be placed in wetlands/waters or on a beach dune and its purpose:

Will the structure be placed on pilings? ____ Yes ____ No	Total area occupied by any structure. _____ Square Feet
How far will the structure be placed channelward from the back edge of the dune? _____feet	How far will the structure be placed channelward from the back edge of the beach? _____feet

19. NONTIDAL STREAM CHANNEL MODIFICATIONS FOR RESTORATION OR ENHANCMENT, or TEMPORARY OR PERMANENT RELOCATIONS

If proposed activities are being conducted for the purposes of compensatory mitigation, please attach separate sheets of paper providing all information required by the most recent version of the stream assessment methodology approved by the Norfolk District of the U.S. Army Corps of Engineers and the Virginia Department of Environmental Quality, in lieu of completing the questions below. Required information outlined by the methodology can be found at:
http://www.nao.usace.army.mil/Missions/Regulatory/UnifiedStreamMethodology.aspx *or*
http://www.deq.virginia.gov/Programs/Water/WetlandsStreams/Mitigation.aspx.

For all projects proposing stream restoration provide a completed Natural Channel Design Review Checklist and Selected Morphological Characteristics form. These forms and the associated manual can be located at:
https://www.fws.gov/chesapeakebay/StreamReports/NCD%20Review%20Checklist/Natural%20Channel%20Design%20Checklist%20Doc%20V2%20Final%2011-4-11.pdf

Has the stream restoration project been designed by a local, state, or federal agency? ____ Yes ____ No. If yes, please include the name of the agency here: _____.

Is the agency also providing funding for this project? _____ Yes _____ No

Stream dimensions at impact site (length and average width in linear feet, and area in square feet):
L: _____(feet) AW:_____ (feet) Area:_____ (square feet)

Contributing drainage area: _____acres *or* _____square miles

APPENDIX A

Adjacent Property Owner's Acknowledgement Form

I, _____, own land next to/ across the water from/ in the same cove
(print adjacent property owner's name)

as the land of _____.
(print applicant's name)

I have reviewed the applicant's project drawings dated _____ to be submitted for all
(date of drawings)

necessary federal, state, and local permits.

_____ I have no comment regarding the proposal

_____ I do not object to the proposal

_____ I object to the proposal

The applicant has agreed to contact me for additional comments if the proposal changes prior to construction of the project.

(Before signing this form, please be sure that you have checked the appropriate option above)

_____
Adjacent property owner's signature

_____
Date

NOTE: IF YOU OBJECT TO THE PROPOSAL, THE REASON(S) YOU OPPOSE THE PROJECT MUST BE SUBMITTED TO VMRC IN WRITING. AN OBJECTION WILL NOT NECESSARILY RESULT IN A DENIAL OF A PERMIT FOR THE PROPOSED WORK. HOWEVER, VALID COMPLAINTS WILL BE GIVEN FULL CONSIDERATION DURING THE PERMIT REVIEW PROCESS.

APPENDIX A

Adjacent Property Owner's Acknowledgement Form

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(print applicant's name)

I have reviewed the applicant's project drawings dated _____ to be submitted for all
(date of drawings)

necessary federal, state, and local permits.

_____ I have no comment regarding the proposal

_____ I do not object to the proposal

_____ I object to the proposal

The applicant has agreed to contact me for additional comments if the proposal changes prior to construction of the project.

(Before signing this form, please be sure that you have checked the appropriate option above)

_____
Adjacent property owner's signature

_____
Date

NOTE: IF YOU OBJECT TO THE PROPOSAL, THE REASON(S) YOU OPPOSE THE PROJECT MUST BE SUBMITTED TO VMRC IN WRITING. AN OBJECTION WILL NOT NECESSARILY RESULT IN A DENIAL OF A PERMIT FOR THE PROPOSED WORK. HOWEVER, VALID COMPLAINTS WILL BE GIVEN FULL CONSIDERATION DURING THE PERMIT REVIEW PROCESS.

APPENDIX C

Chesapeake Bay Preservation Act Information

Please answer the following questions to determine if your project is subject to the requirements of the Bay Act Regulations:

1. Is your project located within Tidewater Virginia? X Yes ____No (See map on page 31) - If the answer is "no", the Bay Act requirements do not apply; if "yes", then please continue to question #2.

2. Please indicate if the project proposes to impact any of the following Resource Protection Area (RPA) features:

   ____ Tidal wetlands,

   ____ Nontidal wetlands connected by surface flow and contiguous to tidal wetlands or water bodies with perennial flow,

   ____ Tidal shores,

   ____ Other lands considered by the local government to meet the provisions of subsection A of 9VAC25-830-80 and to be necessary to protect the quality of state waters (contact the local government for specific information),

   ____ A buffer area not less than 100 feet in width located adjacent to and landward of the components listed above, and along both sides of any water body with perennial flow.

If the answer to question #1 was "yes" and any of the features listed under question #2 will be impacted, compliance with the Chesapeake Bay Preservation Area Designation and Management Regulations is required. **The Chesapeake Bay Preservation Area Designation and Management Regulations** are enforced through locally adopted ordinances based on the Chesapeake Bay Preservation Act (CBPA) program. Compliance with state and local CBPA requirements mandates the submission of a ***Water Quality Impact Assessment (WQIA)*** for the review and approval of the local government. Contact the appropriate local government office to determine if a WQIA is required for the proposed activity(ies).

The individual localities, not the DEQ, USACE, or the Local Wetlands Boards, are responsible for enforcing the CBPA requirements and, therefore, local permits for land disturbance are not issued through this JPA process. **Approval of this wetlands permit does not constitute compliance with the CBPA regulations nor does it guarantee that the local government will grant approval for encroachments into the RPA that may result from this project.**

Notes for all projects in RPAs

Development, redevelopment, construction, land disturbance, or placement of fill within the RPA features listed above requires the approval of the locality and may require an exception or variance from the local Bay Act ordinance. Please contact the appropriate local government to determine the types of development or land uses that are permitted within RPAs.

Pursuant to 9VAC25-830-110, *on-site delineation of the RPA is required for all projects in CBPAs*. Because USGS maps are not always indicative of actual "in-field" conditions, they may not be used to determine the site-specific boundaries of the RPA.

Notes for shoreline erosion control projects in RPAs

Re-establishment of woody vegetation in the buffer will be required by the locality to mitigate for the removal or disturbance of buffer vegetation associated with your proposed project. Please contact the local government to determine the mitigation requirements for impacts to the 100-foot RPA buffer.

Pursuant to 9VAC25-830-140 5 a (4) of the Virginia Administrative Code, shoreline erosion projects are a permitted modification to RPAs provided that the project is based on the "best technical advice" and complies with applicable permit conditions. In accordance with 9VAC25-830-140 1 of the Virginia Administrative Code, the locality will use the information provided in this Appendix, in the project drawings, in this permit application, and as required by the locality, to make a determination that:

1. Any proposed shoreline erosion control measure is necessary and consistent with the nature of the erosion occurring on the site, and the measures have employed the "best available technical advice"
2. Indigenous vegetation will be preserved to the maximum extent practicable
3. Proposed land disturbance has been minimized
4. Appropriate mitigation plantings will provide the required water quality functions of the buffer (9VAC25-830-140 3)
5. The project is consistent with the locality's comprehensive plan
6. Access to the project will be provided with the minimum disturbance necessary.

Proposed Placement Site

Typical Dredge Pipeline Route: 20,000 ft +/-

York River

Carters Creek

Cedarbush Creek

Cedarbush Creek Channel

Catlett Islands

Machicomoco State Park

Timberneck Creek

Chesapeake Bay

37.31085
-76.55622

37.31458
-76.54764

37.31001
-76.55643

37.3043
-76.57143

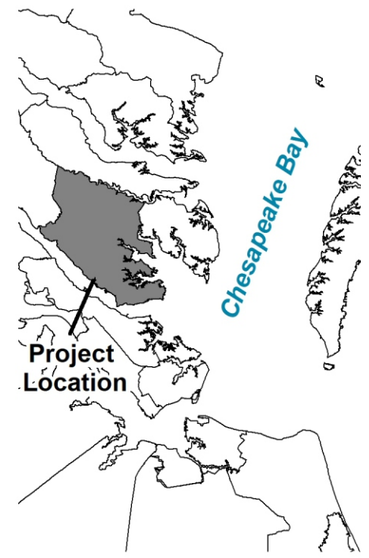
Hermitage Ln
Down Creek Rd
Aberden Creek Rd
Carter Cove
Fairfield Ln
SR 633
Rosewell Plantation
Old Rosewell Ln
1387
Gwyn Ln
Shelly Rd
Horsley Rd
Cedar Bush Rd
Wildflower Ln
New Pines
Raven Ln
636
White Marsh Ln
Piney Swamp Rd
Ramblewood Ln
New Pines Dr
Foxwell Dr
Battle Rd
Laurellye Ln
Creekview Ln
Sweethaven Ln
Old Rosewell Plantation Rd
Borden Rd
Providence Rd
1315
Buckeye Ln
1359
Timberneck Farm Rd
Heath Dr
Fields
Ellis Ln
Williams
Fosque Ln

2,000 0 2,000 Feet

N W E S

VIMS | William & Mary
Virginia Institute of Marine Science
Shoreline Studies Program

Vicinity Map



Virginia Institute of Marine Science
Gloucester County, Virginia

COVERSHEET

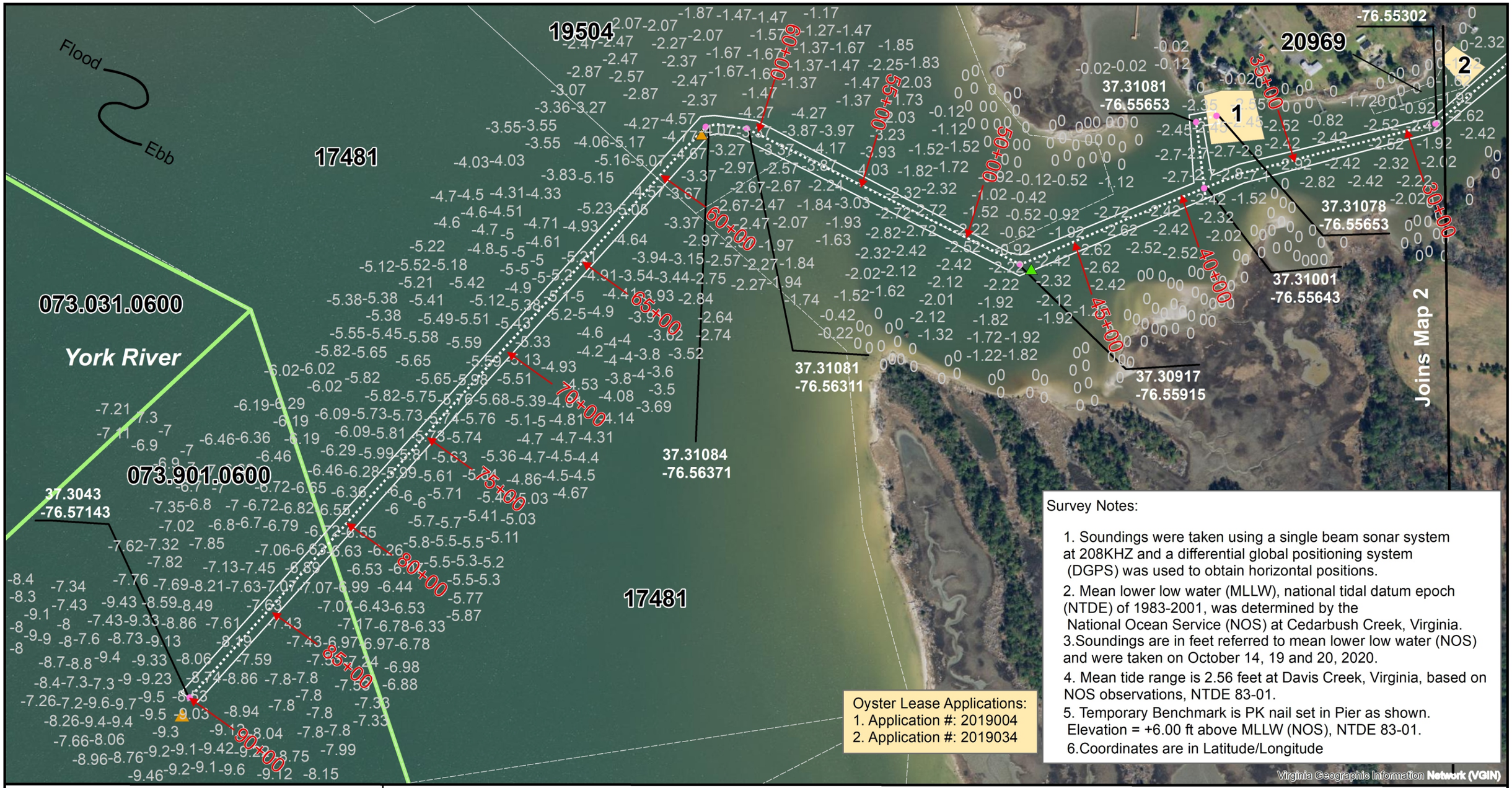
Plans for Dredging

Cedarbush Creek Channel
Gloucester County
Virginia

Sheet 1 of 7

SCALE: AS SHOWN ON SHEET

September 9, 2021



Survey Notes:

1. Soundings were taken using a single beam sonar system at 208KHZ and a differential global positioning system (DGPS) was used to obtain horizontal positions.
2. Mean lower low water (MLLW), national tidal datum epoch (NTDE) of 1983-2001, was determined by the National Ocean Service (NOS) at Cedarbush Creek, Virginia.
3. Soundings are in feet referred to mean lower low water (NOS) and were taken on October 14, 19 and 20, 2020.
4. Mean tide range is 2.56 feet at Davis Creek, Virginia, based on NOS observations, NTDE 83-01.
5. Temporary Benchmark is PK nail set in Pier as shown. Elevation = +6.00 ft above MLLW (NOS), NTDE 83-01.
6. Coordinates are in Latitude/Longitude

Oyster Lease Applications:
1. Application #: 2019004
2. Application #: 2019034

Virginia Geographic Information Network (VGIN)

EXISTING CONDITIONS MAP 1

CEDARBUSH CREEK
GLOUCESTER COUNTY, VIRGINIA

SCALE: AS SHOWN

Aids to Navigation
- Other
- Green
- Red
- Cedarbush Main Channel

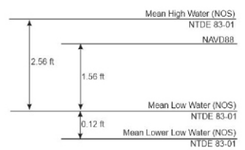
- Private Oyster Leases
- Public Oyster Grounds
- Oyster Lease Applications

N W E S

400 0 400 Feet

Private Oyster Leases

Lease # 19504 Lease Holder: CATSBY JONES
Lease # 17481 Lease Holder: CORINNE GENTILE
Lease # 20969 Lease Holder: EDWARDS FOLTS



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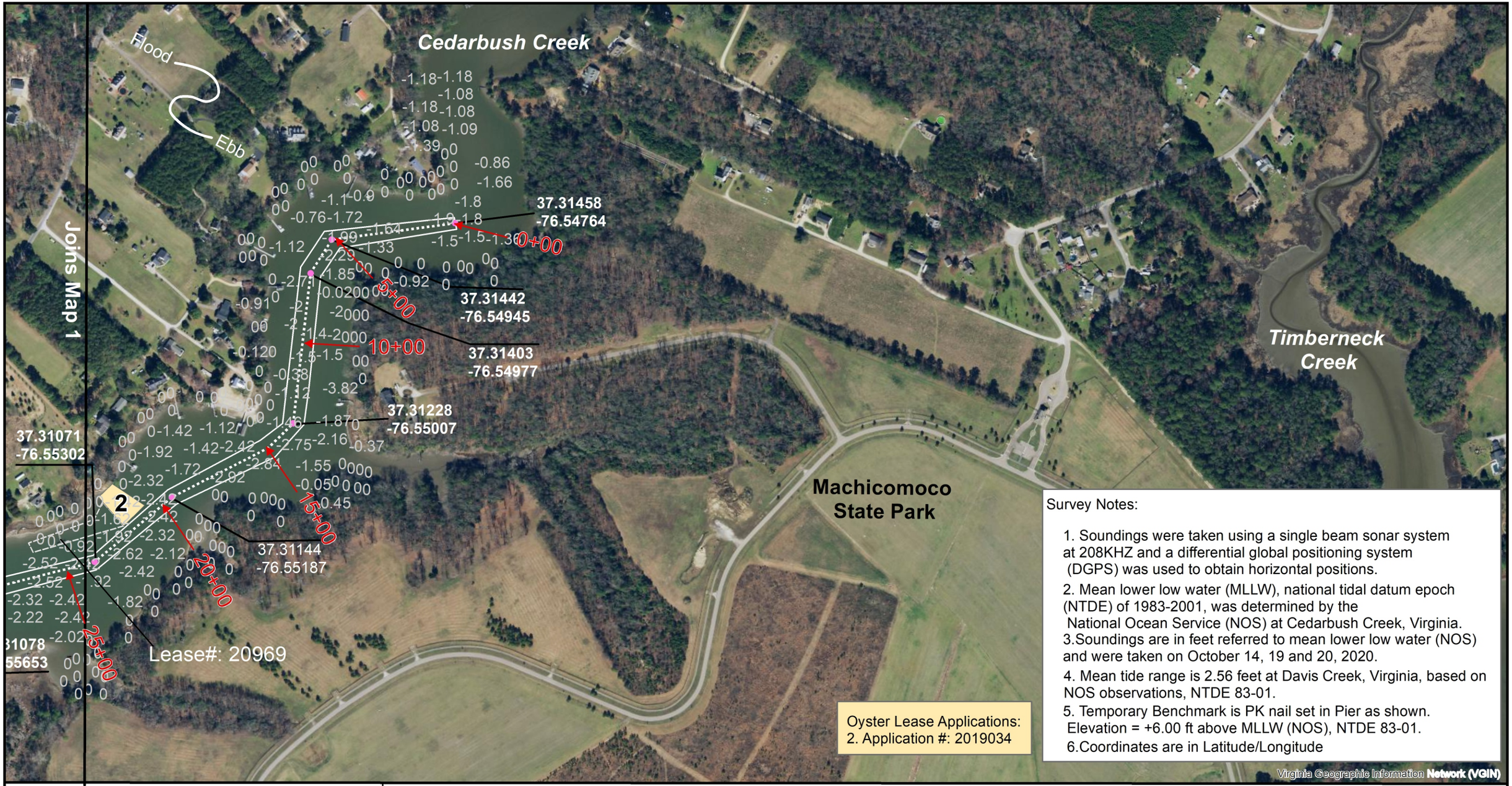


EXISTING CONDITIONS MAP 2

CEDARBUSH CREEK
GLOUCESTER COUNTY, VIRGINIA

SCALE: AS SHOWN

Aids to Navigation
- Other
- Green
- Red
- Cedarbush Main Channel

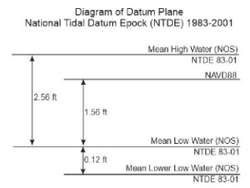
- Public Oyster Grounds
- Oyster Lease Applications
- Private Oyster Leases

N W E S

400 0 400 Feet

Private Oyster Leases

Lease # 20969
Lease Holder: EDWARDS FOLTS



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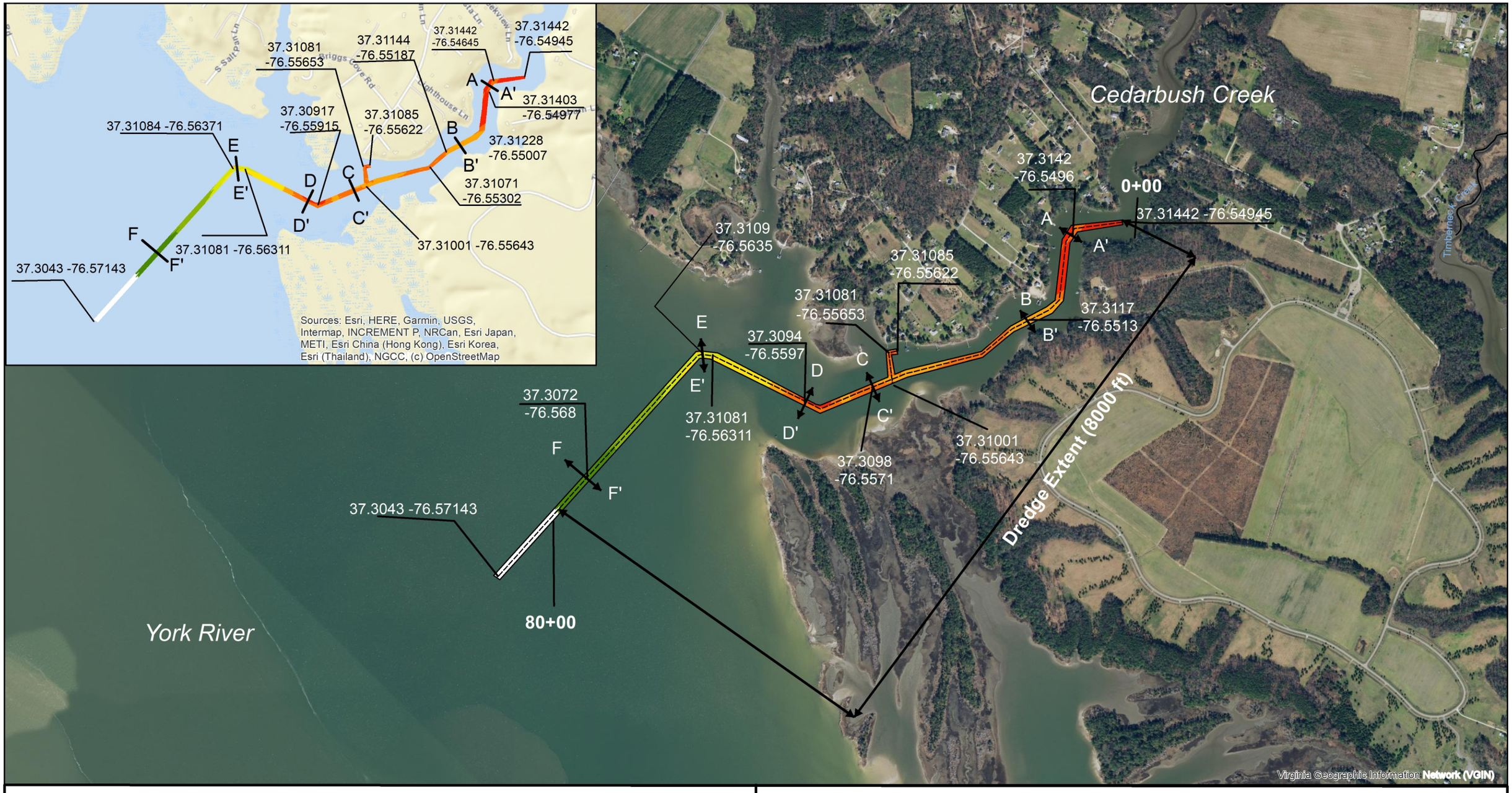

Dredge Extent

Cedarbush Creek
Gloucester County, Virginia

SCALE: AS SHOWN

N W E S

1,000 0 1,000 Feet

Channel Centerline
Cedarbush Creek Channel

No Dredgding
0.1-1
1-2
2-3
3-4
4-5
5-6
6-7

VBMP 2017 WGS

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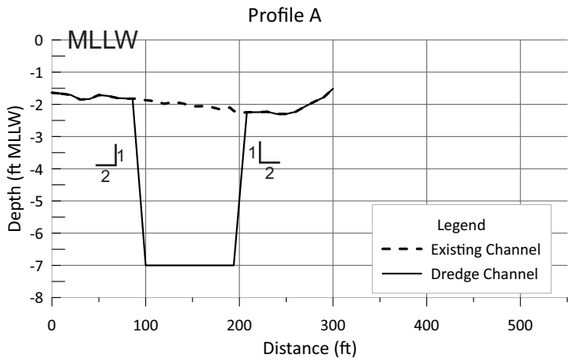

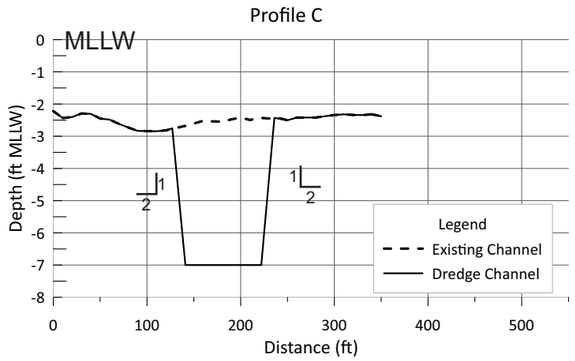

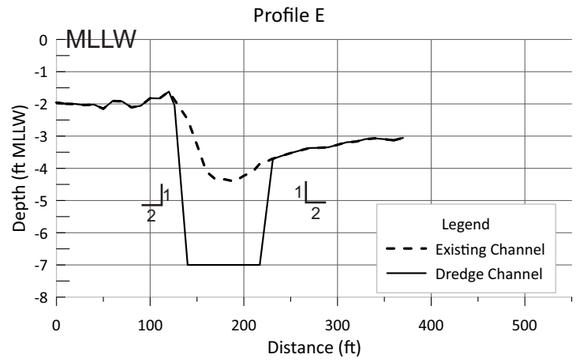

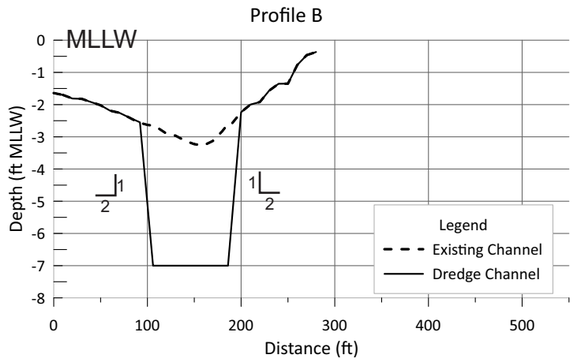

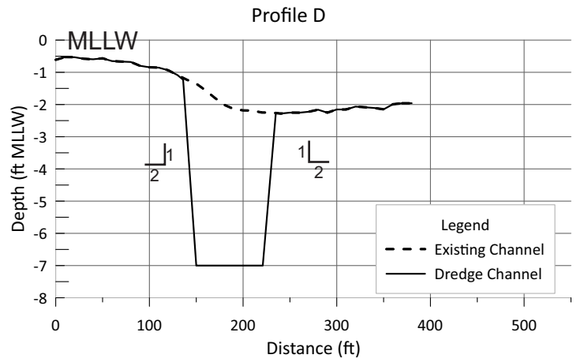

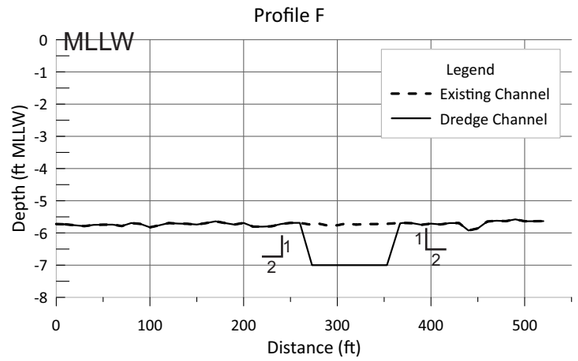

CROSS-SECTIONS
Timberneck Creek Channel
Gloucester County, Virginia

Scale: As Shown

Shoreline Studies Program
VIMS

September 9, 2021

RESOURCES

CEDARBUSH CREEK
GLOUCESTER COUNTY, VIRGINIA

SCALE: AS SHOWN Image: NAIP 2018

National Wetlands Inventory

- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine
- SAV Composite Footprint (2015-2019)
- Public Oyster Grounds

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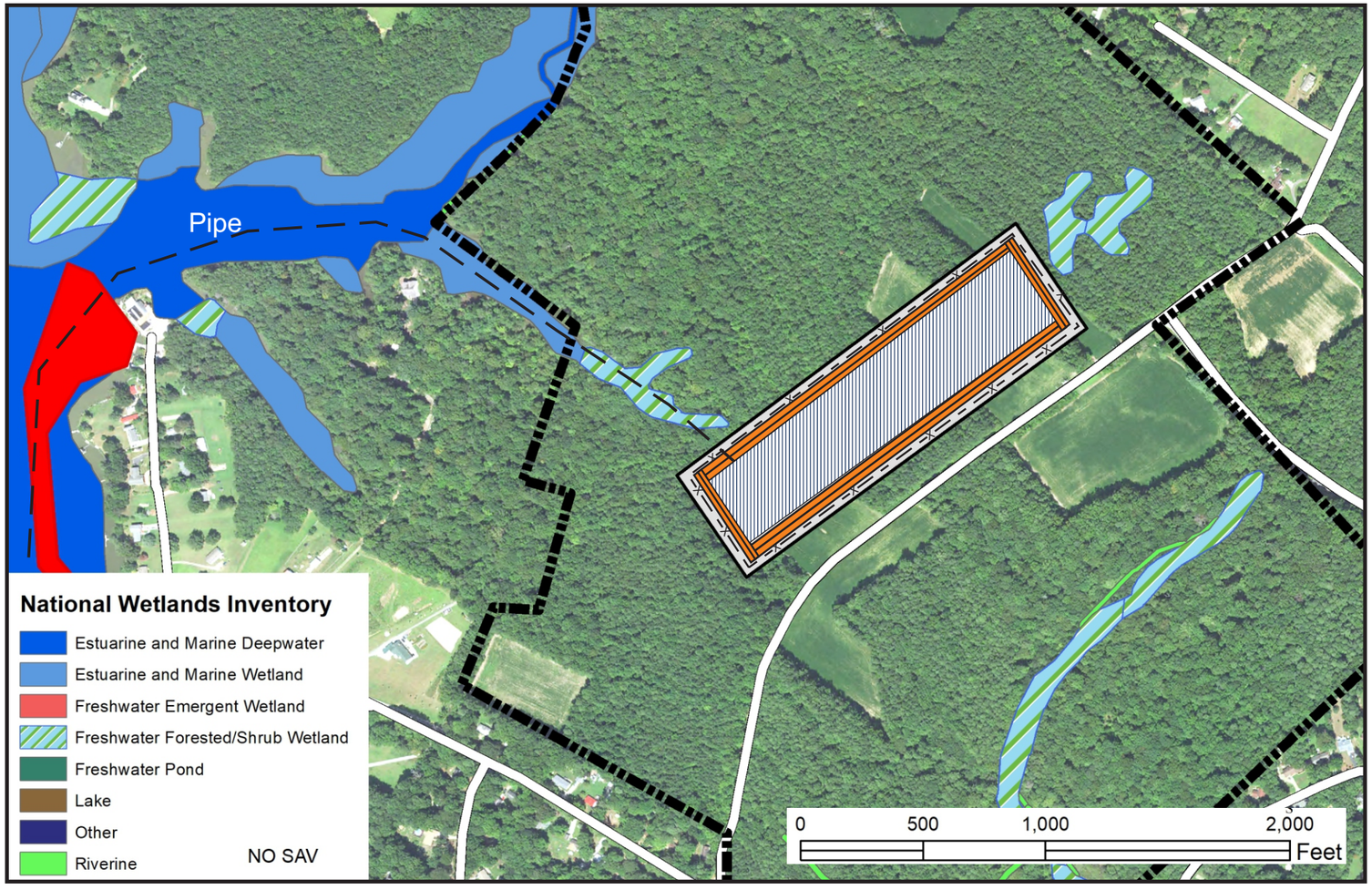
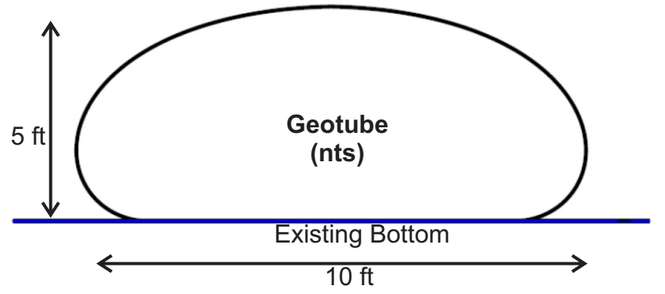
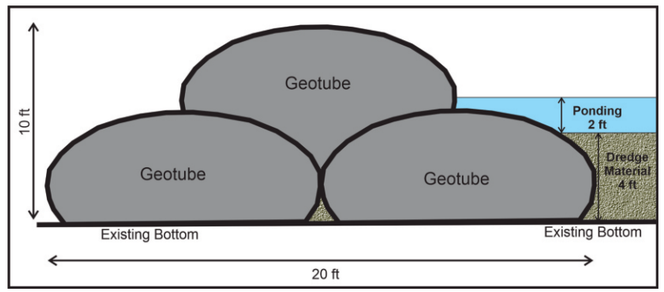


Units:	English	
Water Level:	Fully Emerged	
Geotube® Height (H) =	5	ft
Geotube® Circumference (C) =	25	ft
Relative Density of Fill Material =	1.8	sg
Geotube® Fabric Type:	GT1000MOLAP	
Geotube® Fabric Type:	Rigid Mechanical	
Circumferential Tensile Force (T) =	85.37	lb/in.
Geotube® Base Contact Width (B) =	6.69	ft
Geotube® Filled Width (W) =	9.89	ft
Geotube® Cross Section Area (A) =	41.43	sq ft
Geotube® Volume Per Unit of Length (V) =	1.53	cu yd/ft
FS of Circumferential Failure =	13.4	FS
Axial Direction FS (AFS) =	15.0	FS
FS of Fill Port Failure =	12.4	FS





CROSS-SECTIONS
Timberneck Creek Channel
Gloucester County, Virginia

Scale: As Shown

Silt fence
Geotubes (nts)
Dredge Material
Pipe

N
W
E
S

Shoreline Studies Program
VIMS

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