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Winter Harbor Dredge Channel Data Report

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Executive Summary

Winter Harbor is a tidal creek that flows between a sandy barrier system and an eroding marsh shoreline. It is an important waterway that provides access to the Chesapeake Bay from the Winter Harbor watershed. In the past, Winter Harbor Inlet was the only hydraulic connection from the Winter Harbor watershed and Chesapeake Bay. The two open water areas of Winter Harbor were separated by marsh channels that hydraulically connected to the mouth at the present-day Winter Harbor Inlet. The federally-defined channel at Winter Harbor was authorized by Congress in 1950. It was authorized as a 12 feet (ft) deep, 100 ft wide channel extending to the 12-ft contour in Chesapeake Bay into Winter Harbor to a point just east of the public landing, a distance of about 7,600 ft. A mooring and turning basin were constructed 12 ft deep and 400 feet^2 with a flared entranced 300 ft long. A traffic survey in 1982 found that the 12 ft depth was not justified and a 6 ft deep channel was maintained.

The sediment in the creek does not contain any contaminants outside of acceptable parameters, but some areas contain a large percentage of fine sediments. Winter Harbor is located in the lower portion of the Chesapeake Bay, for which the overall ecosystem health is in moderate condition. The benthic community of the area is in average condition. The lower portion of the Chesapeake Bay is an important habitat for fish species as well as bivalves, and the northern section of Winter Harbor contains a prevalent amount of submerged aquatic vegetation (SAV), making it a potentially important nursey site for local fish species. Winter Harbor is also an important shellfish harvesting area, and one 74-acre, privately owned plot within the federally-defined channel will be impacted by dredging activities. The area is also home to the threatened northeastern beach tiger beetle (*C. dorsalis dorsalis*), which has been increasing in population locally. Beach renourishment has been identified as a method of increasing beetle population, making this project all the more important.

Shoreline change is dynamic along Winter Harbor's adjacent shorelines. Immediately to the north, most of the shoreline is accreting due to the placement of dredge material along the shore. To the south, medium (-2 to -5 ft/yr) to high (-5 to -10 ft/yr) erosion is occuring. North of the headland where the sandy dredge material is being placed, erosion is medium to high as the barriers continue to erode. In 2017, the southward moving sand has encroached on the channel once again and pushed the natural channel to the south and completely filled in the federal channel to the point where some dune vegetation has begun to establish.

The channel was dredged in 1956, 1960, 1966, 1978, and 2010 with dredge material being placed in upland disposal and in sites alongshore adjacent to the channel. In 2010, only the channel mouth and outer channel were dredged because the upland placement area had fallen into disrepair and no funds were available to refurbish it. The inner channel with its higher concentration of fine material that could not be placed along the shoreline as beneficial use, was not dredged.

The proposal is to restore the federally-approved channel depth of -6 ft MLLW with 1 ft of overdepth, removing approximately 118,000 cy of material. The areas near the channel mouth

should be the focus of the project, as they require the most dredging. The spit across the inlet could also be dredged to increase the useful life of the channel, but it would require the removal of an additional 26,000 cy of material. Approximately 78,500 cy of the total 118,000 cy can be placed along the shoreline as beach renourishment. A berm 8 ft MLLW tall and about 170 ft wide will be placed along about 3,000 ft of shoreline. The remaining 39,500 cy of material will need to be placed in an adjacent confined upland disposal area which is currently under federal easement. Though the berm appears to be intact, a site survey and inspection are needed to determine the upgrades needed for its continued use.

Two other proposed strategies, should Mathews County decide to choose a different strategy. If a cheaper option is desired, a -5 MLLW with 1 ft overdepth channel could be created by removing 83,000 cy of material; however, this would not provide the 6 ft depth needed for the US Coast Guard buoy tenders that maintain the aids to navigation (ATONs). If a deeper channel is desired, a -7 MLLW with 1 ft overdepth could be created by removing 156,000 cy of material, though this would be significantly more expensive. Based on data from 2010 dredging activity, where shoaling had already filled in the channel by 2016, the useful life of this project is estimated to be less than 5 years.

To extend the life of the project, two breakwaters were conceptualized. These would be placed in the nearshore along the northern section of the barrier island and near the channel. These structures would capture sand traveling alongshore and slow the transport into the channel. Because the sediment transport system is important to downdrift shorelines, structures should not completely stop the flow of sand. The bank along the upland disposal site on the south side of the channel also is eroding and an alongshore structure was designed along this section to protect the disposal area.

Winter Harbor needs dredging in order to remain a safe and accessible channel to the Chesapeake Bay and to ensure that the channel is of adequate depth for continued US Coast Guard maintenance of ATONs. Several proposed options for dredging and channel design are available based upon the needs of Mathews County. Most dredged material will be able to be placed along the shoreline as beach renourishment, but approximately a third will need to be disposed of in a confined upland disposal site.

Dredge Depth+Overdepth (ft)	Volume Fines (cy)	Volume Sand (cy)	Total Volume (cy)	% Fines/D50 (mm) in Sand Portion
-6	24,900	58,100	83,000	14/0.30
-7	39,500	78,500	118,000	18/0.30
-8	56,000	100,000	156,000	19/0.30
Advance Maintenance Areas				
North Spit Area		5,400	5,200	2/0.40
Spit Tip Area		20,600	20,800	2/0.40

Estimated cost for select dredging scenarios at Winter Harbor.

Dredge Depth +Overdepth	Volume Fines	Volume Sand	Mob/Demob	Dredging	Total Cost
(ft MLLW)	(cy)	(cy)	($)	($)	($)
-6	24,900	58,100	$700,000	$747,000	$1,447,000
-7	39,500	78,500	$700,000	$944,000	$1,644,000
-8	56,000	100,000	$700,000	$1,092,000	$1,792,000
Advance Maintenance of Spit					
-5		26,000			$156,000
Rehabilitate upland placement site					$100,000

Table 5. Cost for the proposed structures to reduce sediment deposition into the channel

Sand and Structure Costs	Amount of Rock (tons/ft)	Length (ft)	Cost/Ton ($ installed)	Mob Demob (%)	Plants ($3/plant)	Total ($)
Northern Breakwater	12	415	120	10		$657,400
Channel Breakwater	11	315	120	10		$457,400
Disposal Area Brill*	2	510	130	15	$20,400	$154,800
Plants for Sand Fill Berm					$573,300	
*If grading is not preferred, 510 cy of sand can be brought in at a cost of $40,000						

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1 Introduction

Winter Harbor is a tidal creek located in Mathews County, Virginia (Figure 1). The entrance to Winter Harbor is a tidal inlet that ebbs and flows between a sandy barrier system to the north and an eroding marsh shoreline to the south (Figure 2). In the past, Winter Harbor Inlet was the only hydraulic connection from the Winter Harbor watershed and Chesapeake Bay. The two open water areas of Winter Harbor were separated by marsh channels that hydraulically connected to the mouth at the present-day Winter Harbor Inlet. Garden Creek to the north was essentially a tidal pond with only a small marsh channel that connected to the Bay. It did not effectively connect to Winter Harbor.

A well-defined inlet channel can be seen in 1937 with a large flood shoal inside the creek and a modest ebb shoal in Chesapeake Bay (Figure 3). Garden Creek to the north has been dredged open and the narrow channel maintained by jetties. The net littoral drift in this section of shore is to the south as evidenced by the accretion of sand on the northern jetty. These jetties interrupted the flow of sand south. The sandy barrier islands just south of Garden Creek were getting narrower, and in the center section, only sand existed with little marsh to maintain the barrier. A small canal, about 20 feet (ft) wide, was dredged northward to connect Garden Creek. By 1953, this canal about 35 ft wide (Figure 4) and may have altered the tidal hydraulics of both tidal water sheds such that Winter Harbor did not have an "efficient" tidal prism to help maintain an adequate channel cross-section. Sand moving south along the barrier islands began to encroach on the channel. Garden Creek Inlet also had difficulty maintaining itself as sand moved south through littoral drift. Eventually, the jetties were completely covered and the inlet clogged. Remnants of the jetties remain approximately 400 ft east of the present shorelines.

The sandy barrier south of Garden Creek continued to narrow and first broke through just prior to 1978. By 1994, the narrow barrier had completely breached and widened so that northern Winter Harbor shoreline was open to the Bay wind/wave energy (Figure 6). Tidal hydraulics were significantly altered with flow increasing into Garden Creek through the canal because Garden Creek Inlet was still plugged with sand. By 2021, the canal was 150 ft wide with flood and ebb shoals on either end. Flow likely decreased through Winter Harbor Inlet because the breach acted as second inlet. The breach would act as a sand sink, but enough sand was still transported south to Winter Harbor to block the channel especially with reduced tidal outflow.

The Federally-defined channel at Winter Harbor was authorized by Congress in 1950. It was authorized as a 12 ft deep, 100 ft wide channel extending to the 12-foot contour in Chesapeake Bay into Winter Harbor to a point just east of the public landing, a distance of about 7,600 ft. The authorization included a mooring and turning basin 12 ft deep and 400 square feet with a flared entranced 300 ft long. A traffic survey in 1982 found that the 12 ft depth was not justified and a 6 ft deep channel was maintained. Authorization is in place for a 12-foot deep channel should traffic justify a need for a change. The channel was dredged in 1956, 1960, 1966, 1978, and 2010 with dredge material being placed in upland disposal and in sites alongshore adjacent to the channel (Figure 5).

The 2010 cycle occurred in the inlet and the approach channel with the sandier material being placed along the shoreline to the north. Sand dredged from Winter Harbor and placed along the north coast would be transported south back into the inlet in a short period of time, requiring ongoing maintenance dredging.

During the last channel dredging in 2010, only the mouth and outer channel were dredged. Because the upland placement area had fallen into disrepair and no funds were available to refurbish it, the inner channel, with its higher concentration of fine material that could not be placed along the shoreline as beneficial use, was not dredged. Only the channel was dredged; the spit that extended into the channel from the north ended up being split during the process. The southernmost tip of the spit that remained adjacent to the channel (Figure 7) allowed sand to migrate back in to the channel. The adjacent upland disposal site was and is actively eroding on the Bay side (Figure 8). Shoreline change is dynamic along Winter Harbor's adjacent shorelines. To the north, most of the shoreline is accreting due to the placement of dredge material along the shore (Figure 9). To the south, medium (-2 to -5 ft/yr) to high (-5 to -10 ft/yr) erosion is occuring. North of the headland where the sandy dredge material was placed, erosion is medium to high as the barriers continue to erode. In 2017, the southward moving sand has encroached on the channel once again and pushed the natural channel to the south and completely filled in the Federal channel.

In 2021, the spit across the mouth of Winter Harbor continues to elongate and narrow (Figure 10). Over time, vegetation has grown on the dredge placement area. In 2010, the placement area was covered by low vegetation. However, by 2021, dense trees populate the area.

2 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. The subaerial portion of the spit was surveyed by Waterway personnel on foot at the same time as the bathymetry.

Coordinates were taken in US survey feet and referred to the Virginia State Plane coordinate system south zone based on NAD83 (Figure 11). Soundings were taken in October and November, 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 Winter Harbor. Mean tide range is 1.65 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 cell size was 5 ft x 5 ft and represents the bathymetry in feet relative to MLLW (Figure 12). The DEM can be used to calculate the amount of material that will be removed during dredging by assigning the grid cells the desired dredge depth values, and to determine the difference between the existing bathymetry and the depth values represented by the DEM.

Light Detection and Ranging (Lidar) is a remote sensing method that uses light in the form of a pulsed laser to measure distances to earth. These light pulses—combined with other data recorded by the airborne system — generate precise, three-dimensional information about the shape of the Earth and its surface characteristics. The lidar data for Winter Harbor was flown by drone on 5 July 2021 around 1500 Eastern Daylight Savings Tme using a Matrice 210 RTK V2 drone & Velodyne LIDAR Ultra Puck at an altitude of 360 ft. Dr. Donglai Gong, a professor at VIMS, obtained and processed the data. Data was exported in a horizontal projection of WGS84 UTM 18N (EPSG:32618) and a vertical datum of EGM2008.

The lidar data was imported into Esri ArcMap as a LAS dataset. The data was filtered for the last return and a 1 ft x 1 ft DEM was created to display the data (Figure 10). In the vicinity of Winter Harbor, EGM2008 is about 4.2 ft above MLLW. Elevation data from two transects was exported to show the elevations across the shoreline in the north and across the upland disposal area in the south (Figure 10). The transects were plotted to show elevation changes.

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 6, 2020 (Figure 13). 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 Winter Harbor's core 7, 4-centimeter (cm) samples were taken from the top of the core at 12 cm intervals down core to a depth of 300 cm (Table 1). Using ^{210}Pb radioisotopes, it was found that the inner channel at Winter Harbor has a high sediment accretion rate of 5.08

cm/yr. ^{137}Cs radioisotopes are used to determine the approximate age of the sediments at a particular depth by assuming the peak of ^{137}Cs is the year 1963. Because Winter Harbor has been dredged several times over the years, there was no clear ^{137}Cs peak, as the sediments have been repeatedly mixed.

Table 1. Summary table of ^{210}Pb and ^{137}Cs chemical analysis of Winter Harbor sample cores.

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)
WH-07_8-12cm	8 - 12 cm	10	2	3.435	0.2033	1.23	0.0828	0.00960
WH-07_24-28cm	24- 28 cm	26	2	2.843	0.1882	1.04	0.0506	0.00730
WH-07_40-44cm	40 - 44 cm	42	2	2.718	0.1816	1.00	0.0357	0.00607
WH-07_56-60cm	56 - 60 cm	58	2	2.226	0.1528	0.80	0.0639	0.00750
WH-07_72-76cm	72 - 76 cm	74	2	2.664	0.1750	0.98	0.0895	0.00940
WH-07_88-92cm	88 - 92 cm	90	2	2.538	0.1737	0.93	0.1220	0.01117
WH-07_104-108cm	104 - 108 cm	106	2	2.638	0.1748	0.97	0.0840	0.00881
WH-07_120-124cm	120 - 124 cm	122	2	2.348	0.1615	0.85	0.1087	0.01041
WH-07_136-140cm	136 - 140 cm	138	2	1.544	0.1275	0.43	0.0652	0.00766
WH-07_152-156cm	152 - 156 cm	154	2	1.903	0.1489	0.64	0.1259	0.01057
WH-07_168-172cm	168 - 172 cm	170	2	1.331	0.1271	0.29	0.0738	0.00832
WH-07_200-204cm	200 - 204 cm	202	2	0.509	0.0791	-0.67	0.0407	0.00484
WH-07_232-236cm	232 - 236 cm	234	2	0.407	0.0658	-0.90	0.0378	0.00460
WH-07_264-268cm	264 - 268 cm	266	2	0.641	0.1062	-0.44	0.0768	0.00663
WH-07_296-300cm	296 - 300 cm	298	2	0.498	0.0821	-0.70	0.0837	0.00696

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.

Winter Harbor 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 Winter Harbor for chemical testing – one at an up-creek location and one at a down-creek location (Figure 13). 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 Winter Harbor 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

Winter Harbor is located in the polyhaline salinity zone of the lower Chesapeake Bay. Salinity ranges from about 18 to 30 parts per thousand (ppt). 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 lower Bay had moderate ecosystem health (C+) in 2020 (EcoHealth, 2020). All indicator scores remained the same between 2019 and 2020 except for total Nitrogen, which improved. In 2020, the lower Bay was classified as average, 40% to <60%, on the benthic IBI scale (EcoHealth, 2020).

Habitat is an important factor in bivalve community structure and distribution in the lower Chesapeake Bay. Glaspie & Seitz (2017) found that the greatest densities of deposit-feeding bivalves were in detrital mud habitats; the greatest densities of thin-shelled and surface-dwelling bivalves were in submerged aquatic vegetation (SAV) habitats; and the greatest densities of armored bivalves were in oyster shell habitats. In addition, they reported that SAV increased bivalve diversity by 68, 76, 87, and 94% when compared to oyster shell, detrital mud, coarse sand, and shell hash habitats, respectively. Overall, bivalve diversity was associated with habitat type, habitat volume, and predator densities, and all habitats, particularly SAV, play a role in maximizing bivalve functional diversity in the Chesapeake Bay (Glaspie & Seitz, 2017). In particular, densities of thin-shelled commercial clams were associated with habitats with a high degree of complexity (seagrass and shell) as compared to some less complex habitats (mud, sand, and gravel) (Glaspie et al, 2018). Deposit feeding bivalve densities were lower in areas with higher blue crab densities. Blue crab is the dominant epibenthic predator.

Only 22 acres inside Winter Harbor have been condemned for shellfish harvesting (Figure 14). Currently, 47 privately owned, active oyster ground leases occur in the Winter Harbor area, totaling 389 acres (Figure 15). Only one approximately 74-acre plot will be directly impacted by dredging activities (VMRC, 2021). However, within the federally-authorized channel, dredging will not be an issue. Public clamming grounds occur in the nearshore at the mouth of Winter Harbor and south. North, in front of the eroding sandy barrier, an application for a private oyster lease was submitted in 2018 but has not yet been approved. Submerged aquatic vegetation (SAV) is prevalent inside the northern section of Winter Harbor and to the south along the Chesapeake Bay shoreline (Figure 16).

Cores 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 and Ulanowicz (1989) estimated that approximately 50% of the fish production in Chesapeake Bay is directly linked to a benthic food web.

The abundance and distribution of juvenile fish is monitored as indicators of ecologically important finfish stocks. Recent recreational catches in Virginia are dominated by Atlantic Croaker (*Micropogonias undulatus*), Summer Flounder (*Paralichthys dentatus*), Spot (*Leiostomus xanthurus*), Striped Bass (*Morone saxatilis*), Black Sea Bass (*Centropristis striata*), Bluefish (Pomatomus saltatrix), Pigfish (*Orthopristis chrysoptera*), Weakfish (*Cynoscion regalis*), and Kingfishes (*Menticirrhus spp*.). These species depend on the lower Bay and its tributaries as nursery areas (Tuckey & Fabrizio, 2020). Additional species of recreational interest, such as Scup (*Stenotomus chrysops*), White Perch (*Morone americana*), Silver Perch (*Bairdiella chrysoura*), White Catfish (*Ameiurus catus*), Channel Catfish (*Ictalurus punctatus*) and Blue Catfish (*I. furcatus*), are also found in the lower Bay.

Schloesser & Fabrizio (2019) found that a particular area or habitat type may disproportionately support juveniles of one species due to the influence of spatially varying environmental factors which ultimately reveals spatial patterns. The estimation of habitat suitability for each forage species includes consideration of environmental and physical conditions (e.g., distance to shore, percent fine sediment). Suitable seasonal habitat extents for forage species exhibited strong seasonal and annual signals indicating that for juvenile forage species, suitable habitat conditions resulted from a complex interplay between water quality and the physical properties of the habitat. (Fabrizio et al., 2020). In general, the greatest extent of suitable habitat occurred in summer, and no suitable habitat occurred in fall and winter.

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 subject to frequent natural disturbances. Rates of recovery vary from 6-8 months in estuarine muds, possibly 2-3 years in sand and gravel habitats.

Sometimes permitting agencies will invoke a time of year (TOY) restriction on dredging when species are migrating and/or overwintering. In addition, deeper dredging projects at a site 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.

3 Channel Design and Disposal Strategy

Channel Design

The Winter Harbor channel is 8,500 ft long including the channel and turning basin at the public ramp. The creek channel is narrow which restricts tidal flow to some degree creating faster currents which deepen the channel at the curves. The Federally-approved channel depth is -6 ft MLLW. Presently, to create a -6 ft MLLW channel and 1 ft of over dredge (total dredge depth -7 ft MLLW), approximately **118,000** cubic yards (cy) of material (Table 3) will be hydraulically dredged and disposed of (Figure 17). Much of the channel needs to be dredged, but the area near the channel mouth and just inside needs the most dredging. The calculated DEM is represented in various colors to show the amount of dredging necessary. 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 and are shown in white.

The nature of channel dredging and maintenance can be seen in the core logs and depositional patterns. Typical channel cross-sections depict the change from existing bottom that

will occur due to dredging (Figure 18). They show that the channel has been infilling since it was last dredged. The spit across Winter Harbor Inlet has grown in length, extending far to the south and also growing to over +5 ft MLLW in height. This spit could be dredged on either side of the channel to -5 ft MLLW as advanced maintenance to improve the useful life of the channel (Figure 19). This would result in an additional **26,000 cy** of sandy material to be placed for beneficial use (Table 3). However, ownership of the spit would need to be determined because it has accreted on state bottom and across a federally-authorized channel. Dredging both sides of the channel would be preferred because it would extend the useful life of the channel, but dredging the north side of the channel is more critical because more sand travels southward in the longshore transport system. If portions of the spit are left intact, the sand will migrate back into the channel.

Most of the dredge material would come from Cores 1-5. This material is sand, but cores 2 and 5 have significant amount of fine material mixed in the areas that will need to be dredged (Figure 20). By mean-weighing sediment type across the cores and along the channel length, about **78,500** cy of sandy material would be dredged from about Core 5 bayward (Table 3). This mixed material would have an approximate D50 of 0.30 mm and have about 18% fines. This material could be placed along the shoreline because beach nourishment grain size typically has a D50 be greater than 0.25 mm. Cores 6, 7, and 8 contain clay. This fine material accounts for about **39,500** cy of material that will need to be placed in an upland placement area.

Also modeled was a slightly shallower dredge depth should the county seek to pursue a less expensive option. A -5 ft MLLW channel with a 1 ft over dredge would require about **83,000 cy** of material to be removed (Table 3). Though this option would reduce both the dredging cost per volume and reduce the footprint needed for a disposal area, for longevity of the channel, it is not the preferred option. Also, 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). Also calculated was a -7 ft MLLW channel with a 1 ft over dredge. The amount of material that would need to be removed increases to **156,000** cy. This also is not a preferred option because presently the Federally-defined maintenance depth of the channel is -6 ft MLLW. Also, dredging deeper increases the amount of fine material that would have to be placed in an upland disposal area.

Table 3. Summary of modeled dredge volume scenarios.

Dredge Depth+Overdepth (ft)	Volume Fines (cy)	Volume Sand (cy)	Total Volume (cy)	% Fines/D50 (mm) in Sand Portion
-6	24,900	58,100	83,000	14/0.30
-7	39,500	78,500	118,000	18/0.30
-8	56,000	100,000	156,000	19/0.30
Advance Maintenance Areas				
North Spit Area		5,400	5,200	2/0.40
Spit Tip Area		20,600	20,800	2/0.40

Disposal Strategy

For the recommended -6 ft MLLW with 1 ft overdepth dredging scenario, approximately **78,500** cy of beach suitable sand and about **39,500** cy of fines is recommended to be placed at separate disposal sites (Figure 21). The US Army Corps of Engineers obtained easements for all the area north of the inlet along the barrier islands. They also have an easement at the upland disposal site. The property owners of this area have indicated preliminary support for the concept of sand placement along the shoreline to date and further discussions would need to take place should this option be pursued. The sandy material could be used for beneficial use and be placed north along the shoreline. Though the marsh south of the inlet is eroding, sand placement along this shoreline could be problematic. The sand could be placed in front of the eroding berm and just south where a breach is occurring. However, it is likely that the material could be transported back into the channel. Sand placement farther south along the eroding marsh could be challenging because of the dense SAV coverage in the nearshore. It could be difficult to obtain a permit for covering SAV when other disposal options are available. In previous dredge cycles, the area just to the north of Winter Harbor Inlet was used as the dredge disposal area (Figure 5), but as noted earlier, this sediment moves quickly alongshore and creates the spit that covers the channel. Placing material farther north might be a better choice for placement because it will take longer for the sand to move back to the channel. (Figure 22). The distance the material would have to be pumped is about 1.5 miles.

An application for a private oyster lease ground was submitted to VMRC in 2018 in the area just offshore of the proposed disposal area (Figure 15), but it will not be directly impacted by the proposed placement of material. This placement would also provide the additional benefit to protect/recreate the barrier in front of the northern portion of Winter Harbor. By recreating this section of shore, the shallow water habitat, SAV, and adjacent marsh will be protected from open

Bay hydrodynamic conditions. A typical cross-section for the northern section would use about 28 cy/ft (Figure 23). The berm has a crest elevation of 8 ft MLLW and is about 170 ft wide and is placed along about 3,000 ft of shoreline. The material can be placed at the farthest section north and move south until the sand runs out. The length of the proposed area is about 3,000 ft (Figure 22) would use about **84,000** cy of material which is just slightly more than the amount of sandy material in the preferred scenario. If desired, the berm can be planted with 191,170 plants including *Spartina alterniflora*, *Spartina patens*, and *Ammophila breviligulata*.

If the advanced maintenance areas are dredged, the same configuration could be continued south. The advantage of this method is that eventually, the sediment will move to the south anyway and continue to maintain the beaches farther south. To try and slow the flow of material into the channel without completely disrupting the littoral transport system, a large breakwater could be constructed offshore. Its location is at the end of the sandy berm (Figure 22) and its typical cross-section is shown in Figure 23. It is a 5 ft MLLW high structure about 30 ft wide with a crest width of 12 ft. Sand does not need to be placed behind the structure because the dredge material will attach behind the structure over time. The location of this breakwater is somewhat flexible. Its placement can be adjusted south if the sand berm extends farther alongshore. However, it does not have to be adjusted. It will be effective in its proposed location regardless of how far the sandy dredge material berm extends.

The upland disposal area in the marsh adjacent to Winter Harbor can be used for holding the fine material. Containment dikes are used to retain water borne sediments, hydraulic fills and other fills so that they are not lost into the surrounding environment. Because the disposal area is under federal easement it may need upgrades to be able to be used for a disposal area. The US Army Corps of Engineers has indicated that they may be willing to transfer the lease for the disposal area to a local entity, but other agencies will have to weigh in on the issue. Prior to the 2009, it was cleared of trees and aerial image indicate that the berm is intact around the entire disposal area (Figure 24). Since then, trees have grown up around the berm and inside the disposal area. Presently, the berm appears to be in good condition (Figure 25) and could possibly be used to contain the dredge material. Trees inside of the upland placement site are not necessarily a problem, but any vegetation in the dike berm may cause integrity issues. The dikes also need to be carefully inspected for muskrat burrows that can cause leakage. Any leakage would cause a dike failure which would be catastrophic for the surrounding environment. The existing outfall pipe is not functional and needs to be addressed. A new spill box and outfall pipe should be furnished and installed by a contractor to control the effluent water quality. A detailed inspection of the disposal site is needed to determine the efficacy of using it and the cost to rehabilitate the site.

Should permitting agencies decide not to allow the use of the existing upland facility, Geotube® units could be used at the site to contain the dredge material. 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. If used at the existing upland disposal site at Winter Harbor, the trees

would still need to be removed. An effluent outfall would be part of the design of the Geotube® project.

Lidar data show that the berm is intact although on the east side of the transect, material has been placed along the berm widening it (Figure 26). So, this transect occurs at the narrowest portion of the placement area. A basin occurs that can hold about 50,000 cy with material placement no more than 4 ft thick. This is the recommended thickness so that the material will dry. Though the placement area could probably hold a thicker layer, it is not recommended. However, after the material dries, the disposal could be used for future dredge cycles.

On the bay side of the disposal area, the berm is eroding along the (Figure 27). The existing channel that is exiting Winter Harbor comes in close to the shoreline. The depths are between -2 and -5 ft MLLW very close to the shoreline. To address the erosion issue, Hardaway et al. (2010) suggested structures for this stretch of shoreline. In addition to stabilizing the placement area, it would reduce the amount of eroded sand from moving back into the channel. Because site conditions are different from what they were when the management plan was produced, a different structure is recommended. A brill (a structure larger than a sill, but smaller than a breakwater) could be built along the shoreline (Figure 28). It would be close to the shoreline because of the deeper channel depths alongshore (Figure 29). Sand can be graded from the bank to place behind the structure. This would reduce the coast was well as stabilize the bank by reducing its grade. However, if grading is not preferred, 510 cy sand can be brought in or placed from the dredge project.

To reduce the amount of sediment pouring into the channel, a nearshore breakwater is proposed north of the channel (Figure 28 & Figure 29). It is a large breakwater that has a crest height of +4 ft MLLW and a crest width of 10 ft. It would be placed offshore with no sand behind it. The sand being naturally transported south will accrete behind the structure. When the sand fills behind the breakwater completely, it will begin to bypass the structure. However, it will bypass around the front of the structure pushing the transport zone in the nearshore zone rather than right along the shoreline. It is likely that some of the sand will be transported offshore and will not plug the mouth of the inlet as quickly. The water depths are very shallow in this area. The structure cannot be moved closer to the shoreline because construction requires a water depth of at least -3 ft MLW to get the barges to the shoreline. All of the structures proposed will have to be built from barges because there is no land access. The goal of the two nearshore breakwaters are to slow the flow of sand into the channel. Some accretion will still continue; however, it is important not to completely stop the flow of sand which would increase erosion downdrift. A jetty was considered as a sand management strategy on the north side of the channel. It is not recommended because it would be a barrier to sediment transport which is important to downdrift shorelines. As the jetty accumulated sand on the north side, additional management would be required to pump the sand to the south side of the channel to minimize impacts.

Longer-Term Sediment Management

Due to the sandy nature of the material in the long-shore transport system on Mathews County's Chesapeake Bay coast, longer-term regional sediment management should be considered. These coarser sands that accumulate at the mouth of Winter Harbor and Horn Harbor farther south can be used to create long-term resiliency for coastal areas of Mathews County. Presently, the approved site for disposal of dredge material at Winter Harbor is updrift of the channel. Though it increases the tiger beetle population as discussed above, it reduces the useful life of the channel as transported sand shoals in the mouth fairly quickly. These sands could potentially be used for projects that have the benefit of reducing coastal flooding and storm impacts along vulnerable coastal properties and infrastructure and protecting coastal habitats from erosion. Through regional sediment management, long-term projects could be identified so that when material becomes available, these projects are ready to be implemented.

In the Mathews County Shoreline Management Plan, Hardaway et al. (2010) created a conceptual plan for addressing the erosion along the upland bank at the placement area using breakwater and beach fill. These structures could be constructed in conjunction with dredge material placement to protect the upland disposal area from continued erosion. Structures on the north side of the Inlet could help slow down shoaling in the channel, but both breakwaters and jetties would have to be large in order to keep from being buried by the strong southward littoral transport system.

Another potential project could be the construction of breakwaters and placement of fill at New Point Comfort Lighthouse. In the past, the lighthouse was attached to land (Hardaway et al., 2010), but due to high erosion rates along this section of coast, it now resides about 0.55 miles offshore. Presently the lighthouse is protected by a large revetment. However, the site is popular with kayakers, and creating a beach could not only improve recreation but also would provide a wide, beneficial buffer around the lighthouse that will enhance protection for this historic building.

Sand and finer sediment is an important natural resource that is critical to the environmental health and economic vitality of the coastal zone. By developing a planning approach that addresses coastal sediment processes and issues on a broader geographic scale, more solutions can be realized. Conserving and restoring the sediment resources along the coastline provides the opportunity to reduce shoreline erosion and coastal storm damages, protect sensitive environmental resources, preserve and enhance beaches, improve water quality along the shoreline, and manage coastal projects for the regional benefit.

Thin Layer Placement

Another potential use for the material from Winter Harbor 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).

The marshes surrounding Winter Harbor are subject to sea-level rise which over time is causing marsh loss over time. South of Winter Harbor, an analysis of marsh changes between 1937 and 2018 showed that marsh being lost due to erosion on the edges of the marsh (Figure 30). In addition, the interior of the marsh is being affected as well. Areas that contained grass in 1937 now are open water. In the near future, additional areas will be converted from vegetated marsh to non-vegetated wetland. This area would be an ideal area for thin-layering to stabilize the marsh. For this reason, thin-layering may prove to be a beneficial strategy for dredging and disposal activities at Winter Harbor particularly if the existing dredge placement area fills up. With about 150 acres of marsh, about 120,000 cy of fine material could be placed in this area at a depth of 6 inches. 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.

Threatened Northeastern Beach Tiger Beetle

The northeastern beach tiger beetle (*C. dorsalis dorsalis*) was listed as threatened in 1990. This once abundant insect has seen their populations greatly decline in Chesapeake Bay because their sandy habitats are impacted by human activities. The northeastern beach tiger beetle is a tiny (13-15 mm), sand-colored beetle that lives on sandy beaches throughout the middle and lower Chesapeake Bay. It feeds near the water's edge on flies, fleas and amphipods, and will also eat dead crabs and fish that wash up on the beach. Beetles mate in late June through August, and females lay their eggs in the sand just above the high tide mark. Eggs hatch in late July through August, and larvae live in vertical burrows in the sand (Chesapeake Bay Program, 2020). Beach width has been identified as the most important habitat variable accounting for presence and abundance of adults and larvae. Because most larvae are at and above the high tide line, narrow beaches do not provide sufficient back beach area for them to survive the effects of storms, tidal fluctuations, and erosional events during their two-year developmental period (Knisley & Gwiazdowski, 2020).

The significant decline and loss of populations of *C. dorsalis dorsalis* along the western shoreline of the Chesapeake Bay in Maryland and Virginia was documented by Knisley, Drummond, & McCann (2016). The Chesapeake Bay beaches occupied by *C. dorsalis dorsalis* are subject to progressive changes from erosion and accretion. The most recent surveys document a significant decline to <40,000 adults at about 70 sites throughout the Bay, with most of the decline along the more heavily populated and developed western shoreline (Knisley et al. 2016). In Mathews County, the beetle was found at three sites, two of which had declining populations. At Bethel Beach North and Bethel Beach, the population was declining, but at Winter Harbor, the population was increasing. In 2008, Winter Harbor had 412 tiger beetles, but in 2012, there were 2,301. In 2010, sand dredged from Winter Harbor federal navigation channel maintenance was placed along the shore. The primary cause of this decline was attributed to shoreline recession from rising tidal levels and the associated dramatic increase in shoreline armoring along the western shoreline (revetments, bulkheads, groins) in the past 20–30 years (Knisley & Gwiazdowski, 2020).

However, beach restoration has been identified as a method to increase the tiger beetle population in the Bay. Fenster et al. (2006) studied the impact of dredge material placement on the endangered tiger beetle within Chesapeake Bay. His study site was just north of Winter Harbor, and the material placed during the course of his study was the dredge spoil from the 2002 Winter Harbor dredging. The results of the study showed that sand nourishment resulted in an increase in adults and larvae of tiger beetle in the nourished region of Winter Harbor. In fact, large numbers of adults and larvae were found in the deposition area at Winter Harbor most

likely because of the additional habitat (beach width) provided by the nearshore deposition (Fenster et al., 2006).

This finding further documents the importance of beach width as a significant habitat requisite for the threatened tiger beetle. Favorable habitats develop and subsist when sufficient (natural or artificial) space (beach width) exists and when the sediment characteristics of the dredge disposal material and natural beach habitat closely match (Fenster et al., 2006). At Winter Harbor Beach, nearshore deposition caused a 150 ft increase on average in beach width. Within weeks of deposition, adult northeastern beach tiger beetles rapidly moved onto the nourished sections of both beaches and produced large numbers of larvae. Winter Harbor Beach experienced the greatest increase in beetle numbers, most likely because of the additional habitat created by nearshore deposition (Fenster et al., 2006). These beach parameters provided habitat for adult foraging, ovipositing and larval survival. Creating a stable beach habitat along the Chesapeake Bay is a restoration opportunity for the tiger beetle. In addition to creating habitat, species placement on site have been shown to increase populations.

Costs

Estimated costs were provided by Waterway Surveys & Engineering and Shoreline Studies Program, VIMS. Dredge material from Winter Harbor will be placed on barrier island remnant in Mathews County. The cost shown in Table 4 includes pumping a total of 118,000 cy material from the channel. The cost includes pumping 78,500 cy to the northern site and spreading it along the shoreline. Should that alternative be considered, it would likely add an additional $156,000 to the dredging costs (assuming mobilization/demobilization costs are shared with the channel dredging project). The use of vegetation on the landward portions of beach nourishment projects can reinforce the stability of the material placed at the site. For this project, about 191,000 plants can be planted on the landward of the +4 ft MLLW berm (Table 5). The northern breakwater described above can be used to help hold dredged sand in place.

The cost also includes pumping 39,500 cy of fines into the adjacent placement area. A complete survey and inspection of the placement area is needed to determine costs for the necessary upgrades to ensure water quality permit compliance. A very rough estimated cost to rehabilitate the upland placement site is $100,000. This would include inspecting the berm for damage, cutting trees off the berm, and installing a spillbox and piping to control the effluent water quality.

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.

Table 4. Estimated cost for select dredging scenarios at Winter Harbor.

Dredge Depth +Overdepth	Volume Fines	Volume Sand	Mob/Demob	Dredging	Total Cost
(ft MLLW)	(cy)	(cy)	($)	($)	($)
-6	24,900	58,100	$700,000	$747,000	$1,447,000
-7	39,500	78,500	$700,000	$944,000	$1,644,000
-8	56,000	100,000	$700,000	$1,092,000	$1,792,000
Advance Maintenance of Spit					
-5		26,000			$156,000
Rehabilitate upland placement site					$100,000

Table 5. Cost for the proposed structures to reduce sediment deposition into the channel

Sand and Structure Costs	Amount of Rock (tons/ft)	Length (ft)	Cost/Ton ($ installed)	Mob Demob (%)	Plants ($3/plant)	Total ($)
Northern Breakwater	12	415	120	10		$657,400
Channel Breakwater	11	315	120	10		$457,400
Disposal Area Brill*	2	510	130	15	$20,400	$154,800
Plants for Sand Fill Berm (191,000)					$573,300	
*If grading is not preferred, 510 cy of sand can be brought in at a cost of $40,000						

Useful Life

Overall, shoaling within the dredge channel is not linear; it starts fairly quickly after dredging but slows over time as the channel reaches equilibrium. 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. Post-dredging, sediment transported along the shoreline and nearshore zone in Chesapeake Bay will accrete at the creek mouth and in the outbound channel. Inside the creek, the dredge channel will likely fill in with finer material brought in by tidal flow and from upland sources.

Using ^{210}Pb radioisotopes found within the Winter Harbor Core 7 samples (Figure 13), it was found that the inner channel at Winter Harbor has a high sediment accretion rate of 5.08

cm/yr (Figure 31). ^{137}Cs radioisotopes are used to determine the approximate age of the sediments at a particular depth by assuming the peak of ^{137}Cs is the year 1963. Because Winter Harbor has been dredged many times over the years, there was no clear ^{137}Cs peak, as the sediments have been repeatedly mixed. This higher rate of sedimentation correlates with an analysis of survey data. Winter Harbor has not been dredged since 2010, and digital data was not available for the post-dredge survey. The channel was surveyed in 2016 by the US Army Corps of Engineers. Rates of infilling were calculated between the 2016 survey and the 2020 survey that was collected for this project (Figure 32). This can be used as guidance for determining the predicted useful life of the proposed project. In those 4 years, nearly 30,000 cy of material filled in the channel, most of it at the mouth and inside the Harbor channel (Figure 32). The front of the spit has eroded between 2016 and 2020 as sediment was transported south and the spit elongated and narrowed. The photo underlaying the analysis in Figure 32 is 2019 and this map shows that the spit shape has changed a great deal even between 2019 and 2020.

Most of recent dredging efforts have been in the sandier outbound channel with material placed directly north of the channel. This material soon began migrating back into the channel. By dredging part of the north spit attachment (advanced lateral maintenance) and placing the material over a mile to the north, southward transport of the dredge material may take several years. However, there is currently a significant amount of littoral sands that will continue to move into the channel most likely at a lesser rate. Structural impediments such as a jetty and/or a breakwater would help reduce this impact and provide long-term shore protection, but at a cost.

Overall, a rough estimate of useful life of this project is < 5 years. From previous dredging in 2010, significant shoaling had already plugged the channel by the 2016 survey. Though the outbound channel and inner channel should remain navigable for a longer period, the mouth will definitely shoal due to the southward littoral transport. Just this section could be maintained at a higher frequency than the inner channels. This will provide sandy material for beneficial use. Constructing the nearshore breakwaters will also help slow the transport, but they will not stop transport, nor would that be the desired result as it would have downdrift consequences. However, it would extend the useful at least for a few years.

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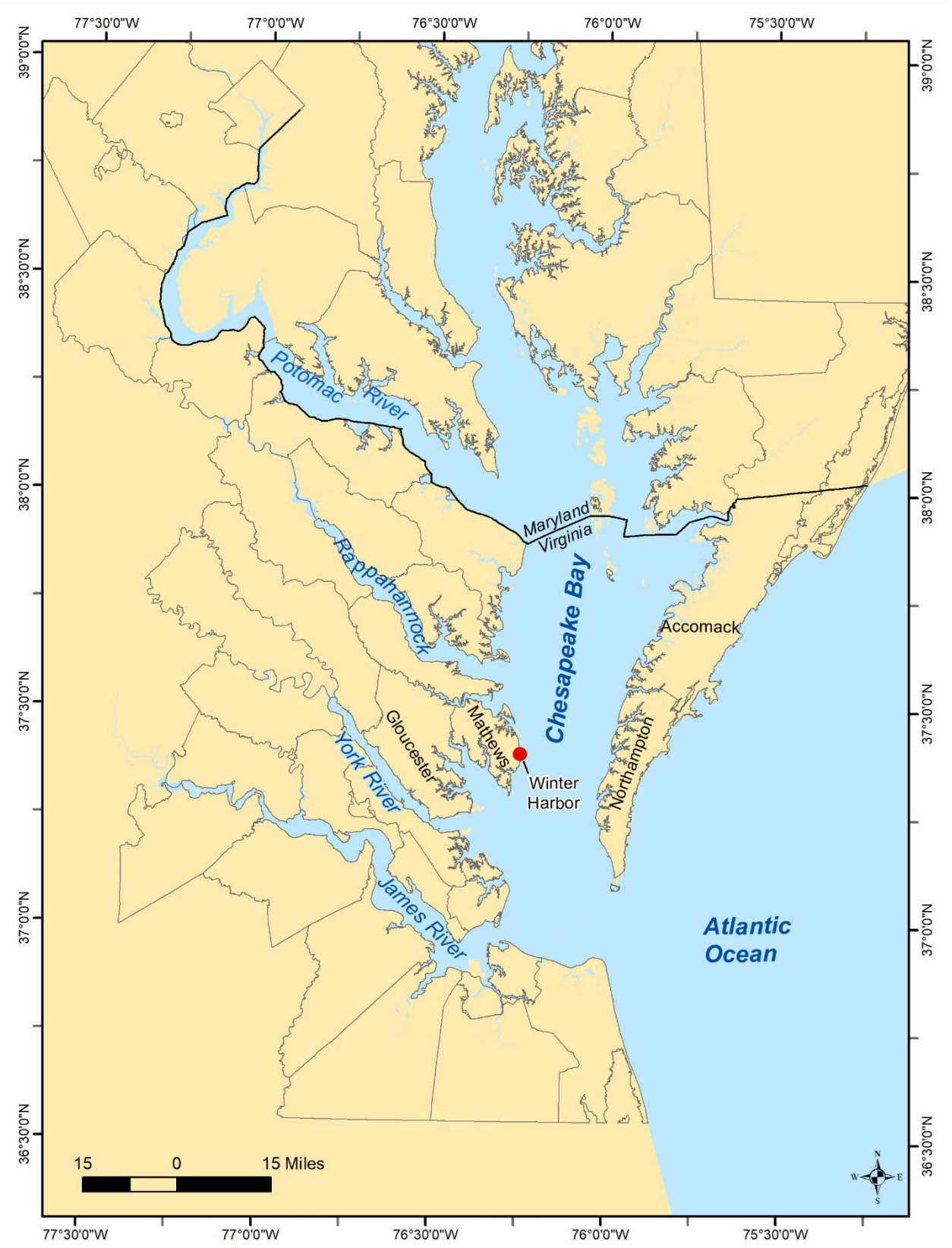


Figure 1. Location of Winter Harbor within the Chesapeake Bay estuarine system.

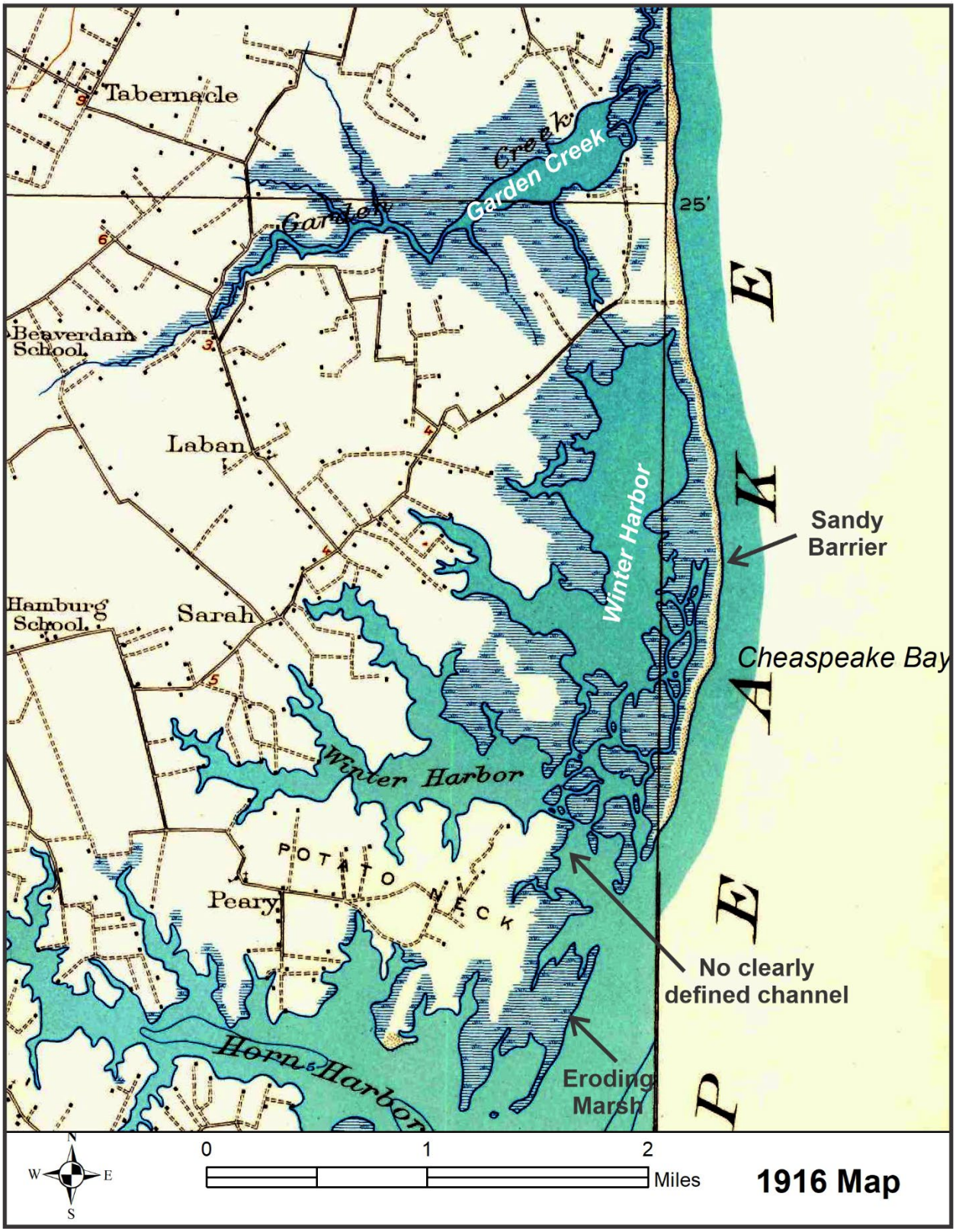


Figure 2. A 1916 map showing Winter Harbor and vicinity.

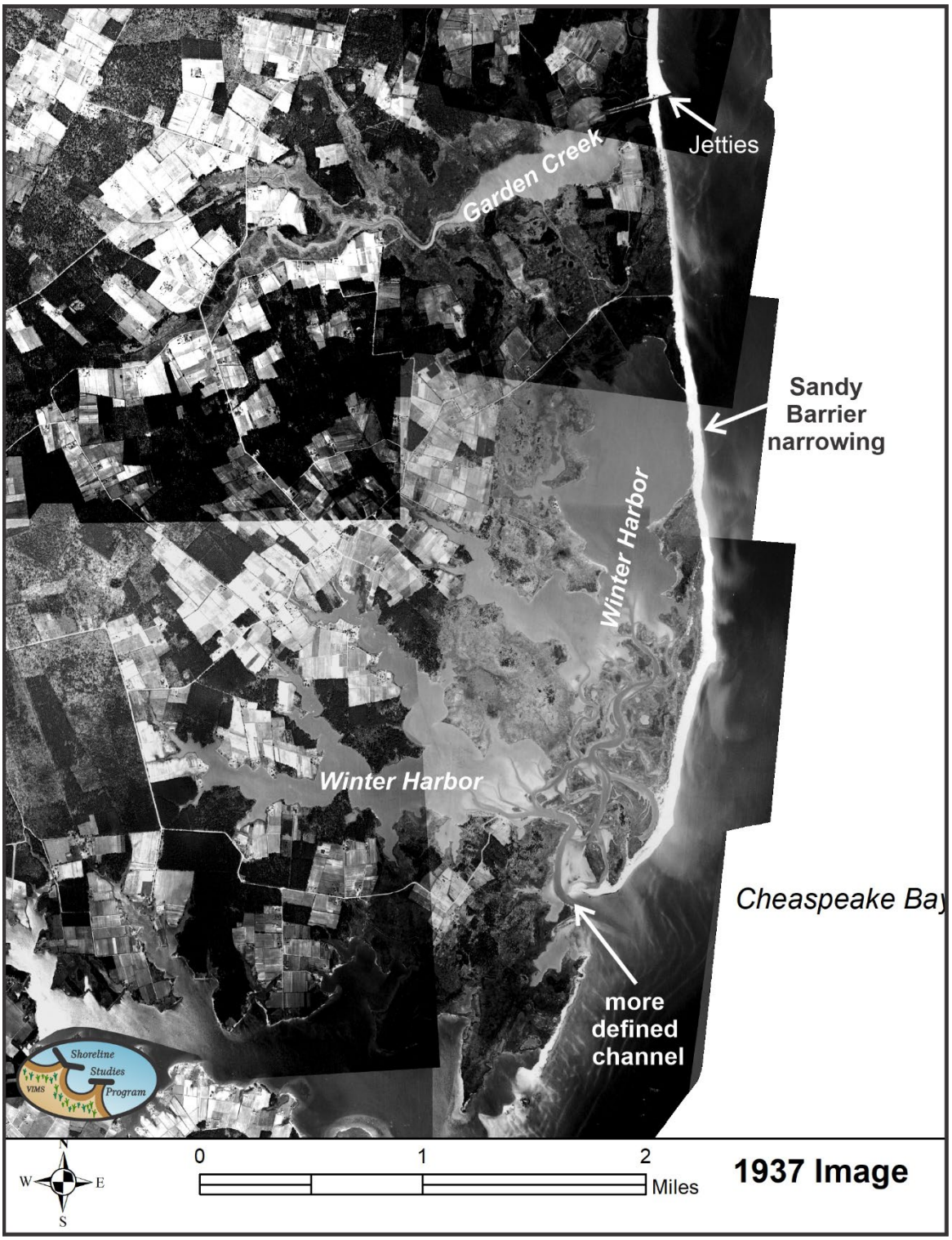


Figure 3. An orthorectified image showing Winter Harbor in 1937. From Shoreline Studies Program Shoreline Change Database.

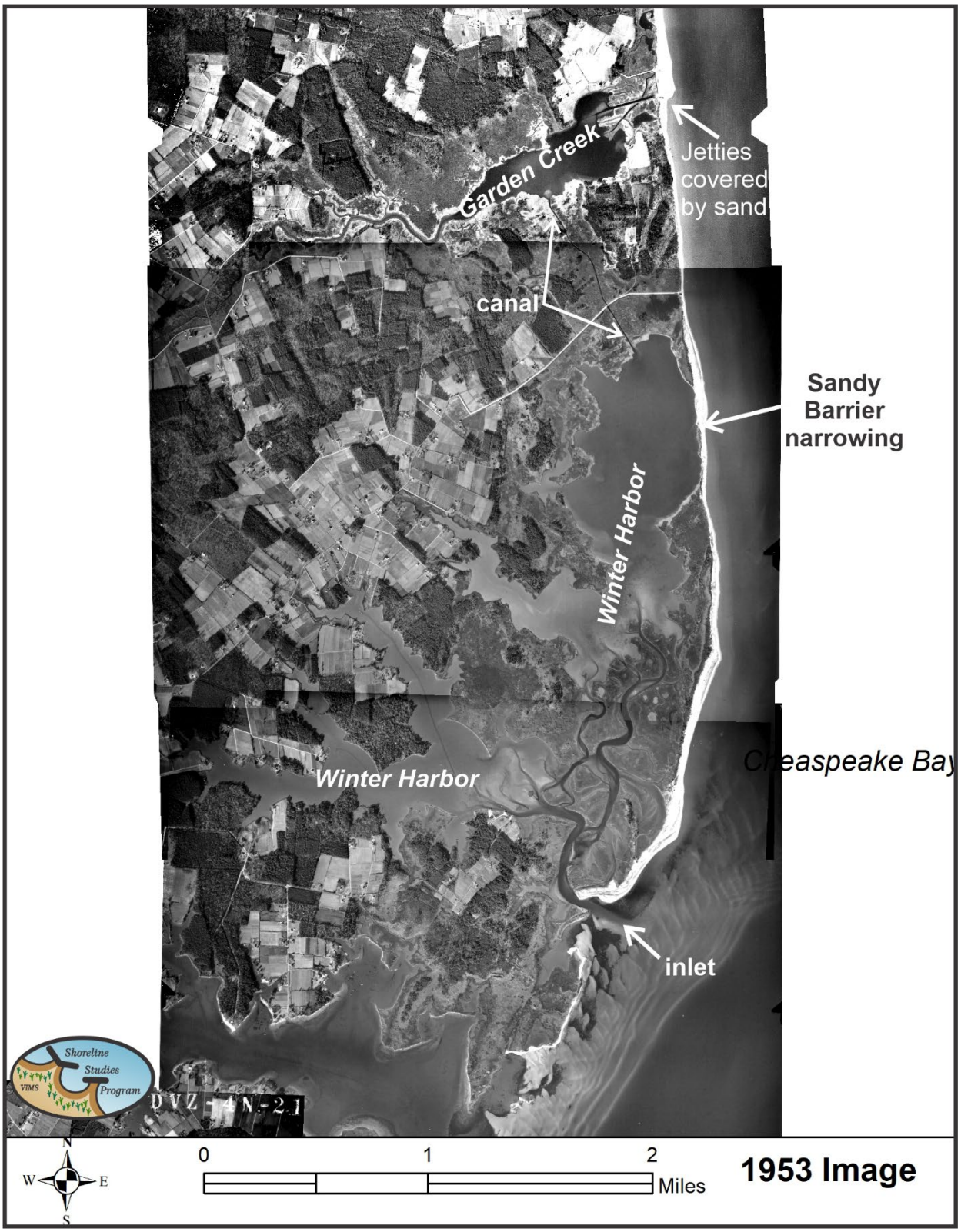


Figure 4. An orthorectified image showing Winter Harbor in 1953. From Shoreline Studies Program Shoreline Change Database.

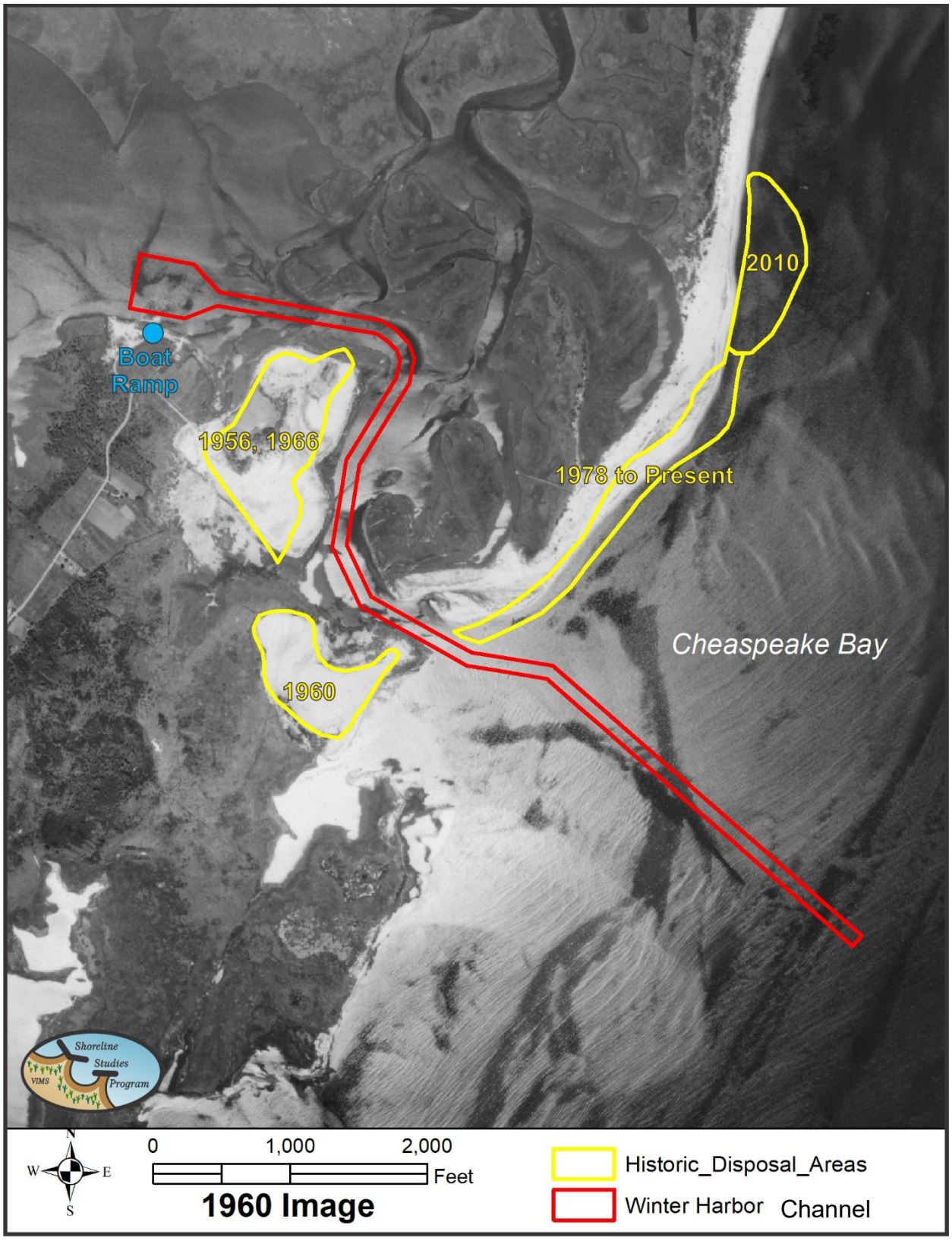


Figure 5. An orthorectified image showing Winter Harbor in 1960. Dredge material placement areas are indicated. From Shoreline Studies Program Shoreline Change Database.

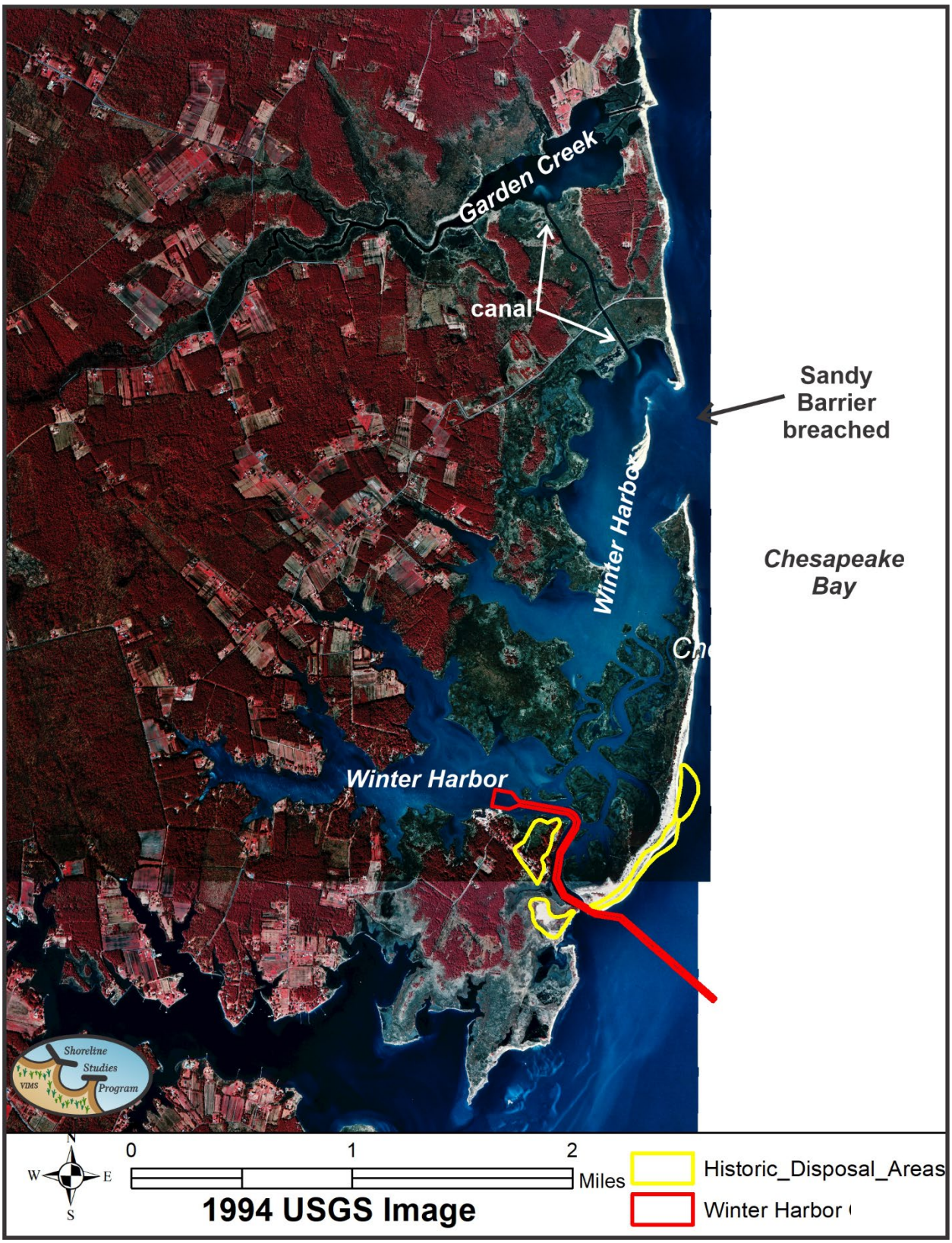


Figure 6. An orthorectified image showing Winter Harbor in 1994. USGS image.

Figure 7. Aerial photo of Winter Harbor Inlet, post dredging in 2010. The material was placed to the north. Only the Federal channel was dredged; the sandy spit south of the channel was left in place.

Figure 8. Photo of the upland placement area's eroding shoreline in 2008. Photo credit: VIMS, Shoreline Studies Program.

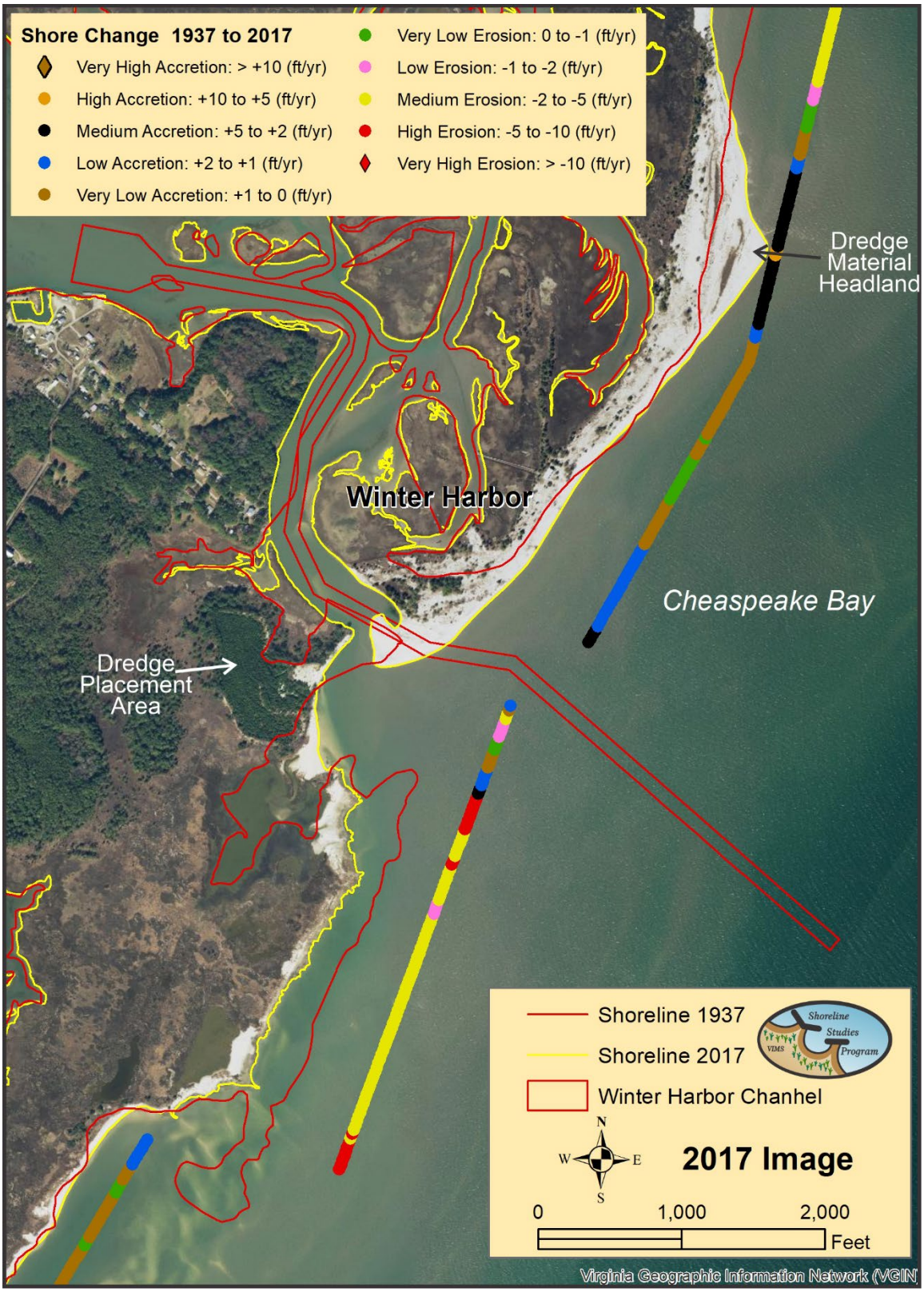


Figure 9. Winter Harbor on the 2017 VGIN image showing the 1937 and 2017 shorelines and 1937-2017 end point rate of change categorization. From Shoreline Studies Program Shoreline Change Database.

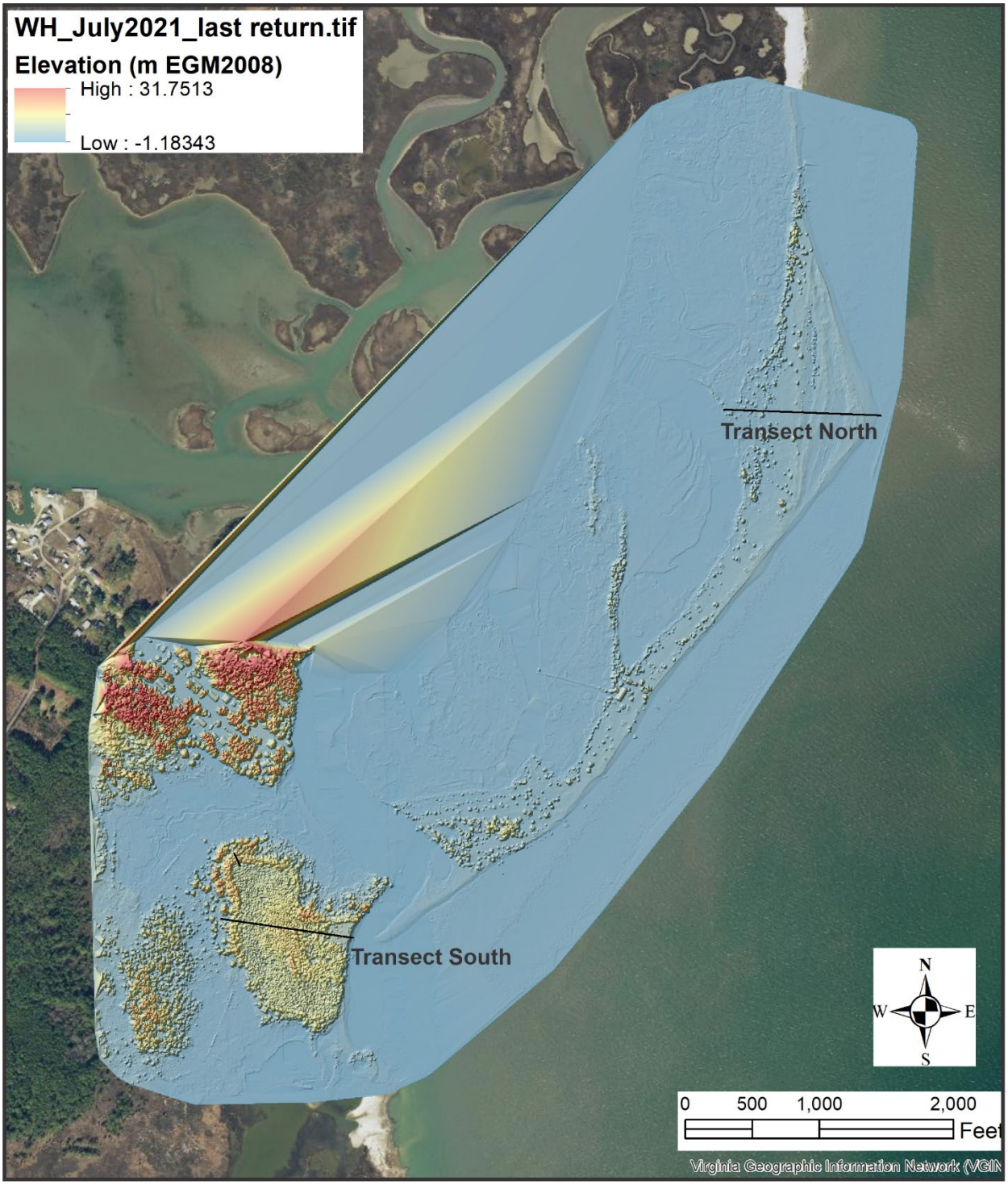


Figure 10. Lidar image taken July 2020 of Winter Harbor, the upland placement area, and adjacent shorelines.

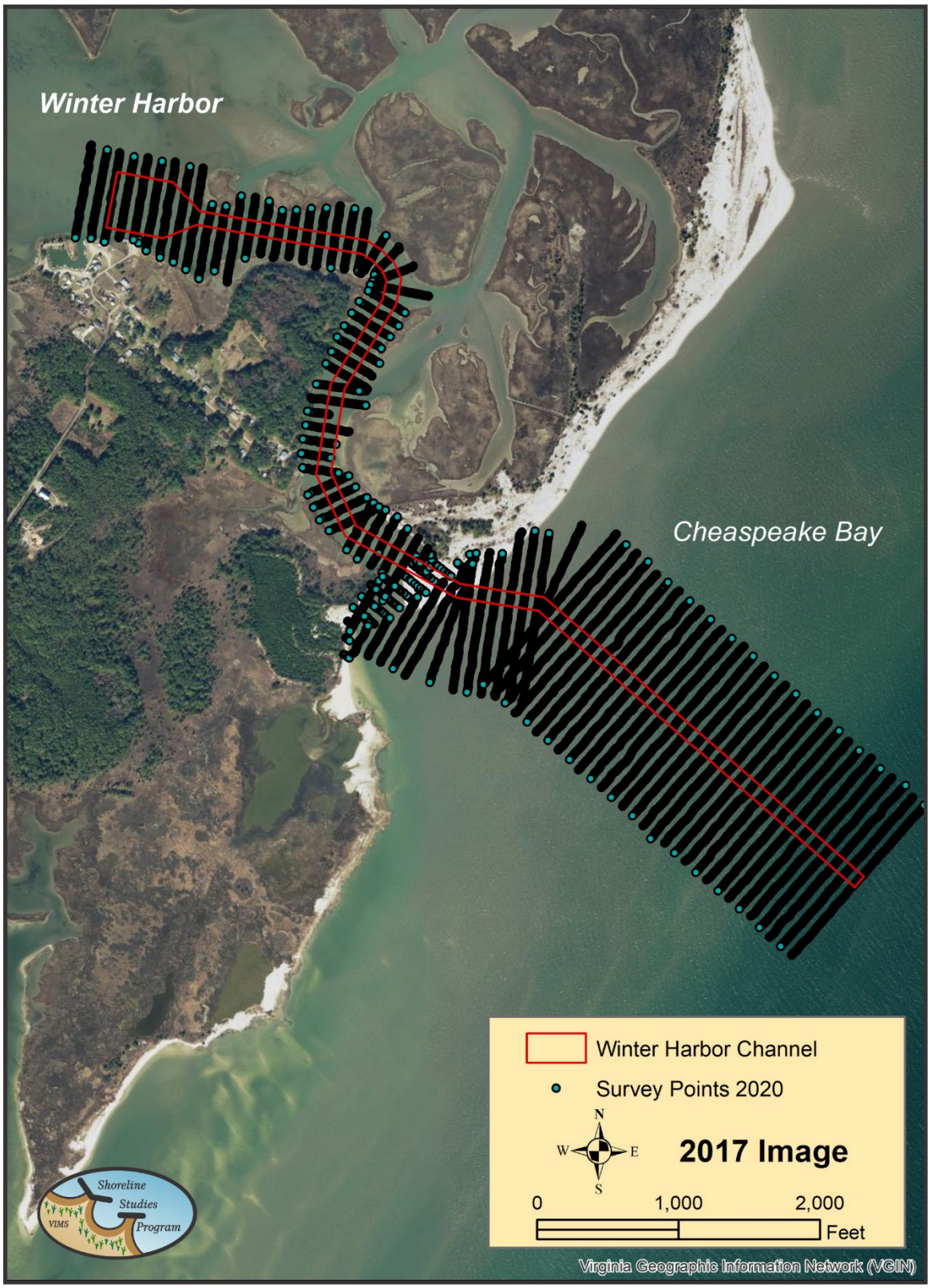


Figure 11. Survey points taken to determine existing bottom elevations at Winter Harbor.

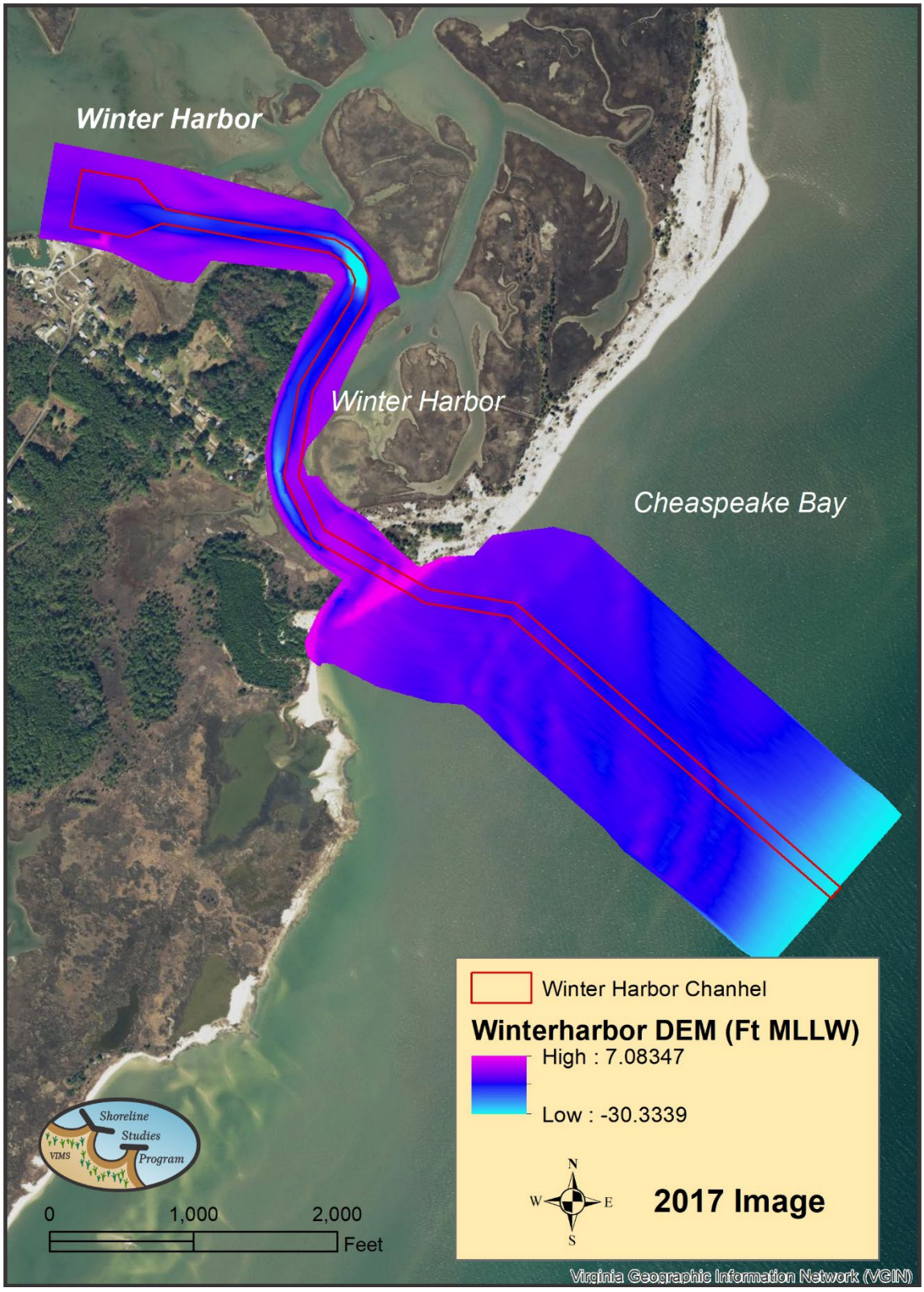


Figure 12. Digital Elevation Model (DEM) derived from survey points showing existing bathymetry of Winter Harbor.

Figure 13. Location of vibracores and chemical samples taken in Winter Harbor.

Figure 14. The areas of Winter Harbor that have been condemned for shellfish harvesting. From https://webapps.mrc.virginia.gov/public/maps/chesapeakebay_map.php

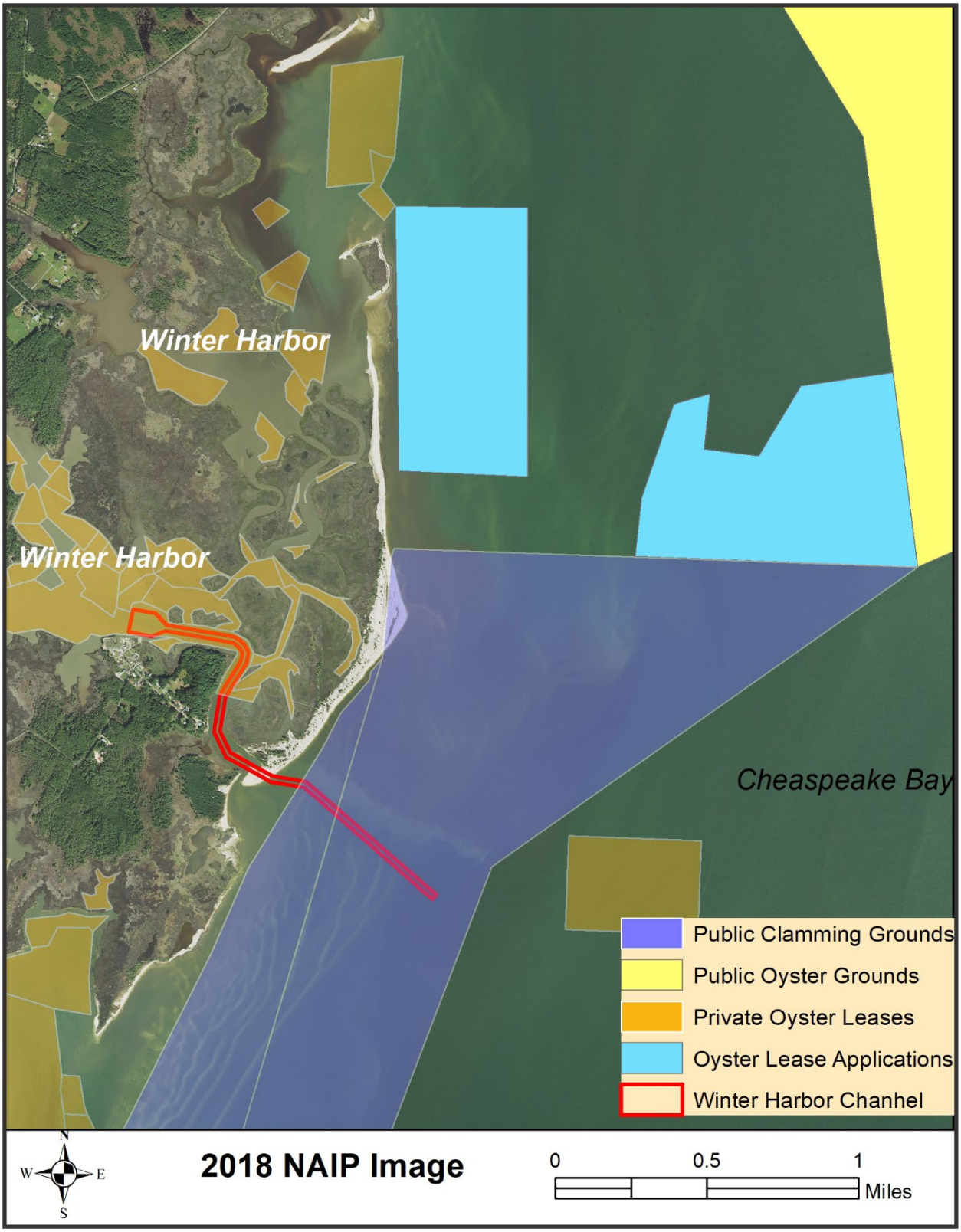


Figure 15. Private oyster ground leases and public bottom that will be affected by the proposed Cedarbush navigation channel. From https://webapps.mrc.virginia.gov/public/maps/chesapeakebay_map.php

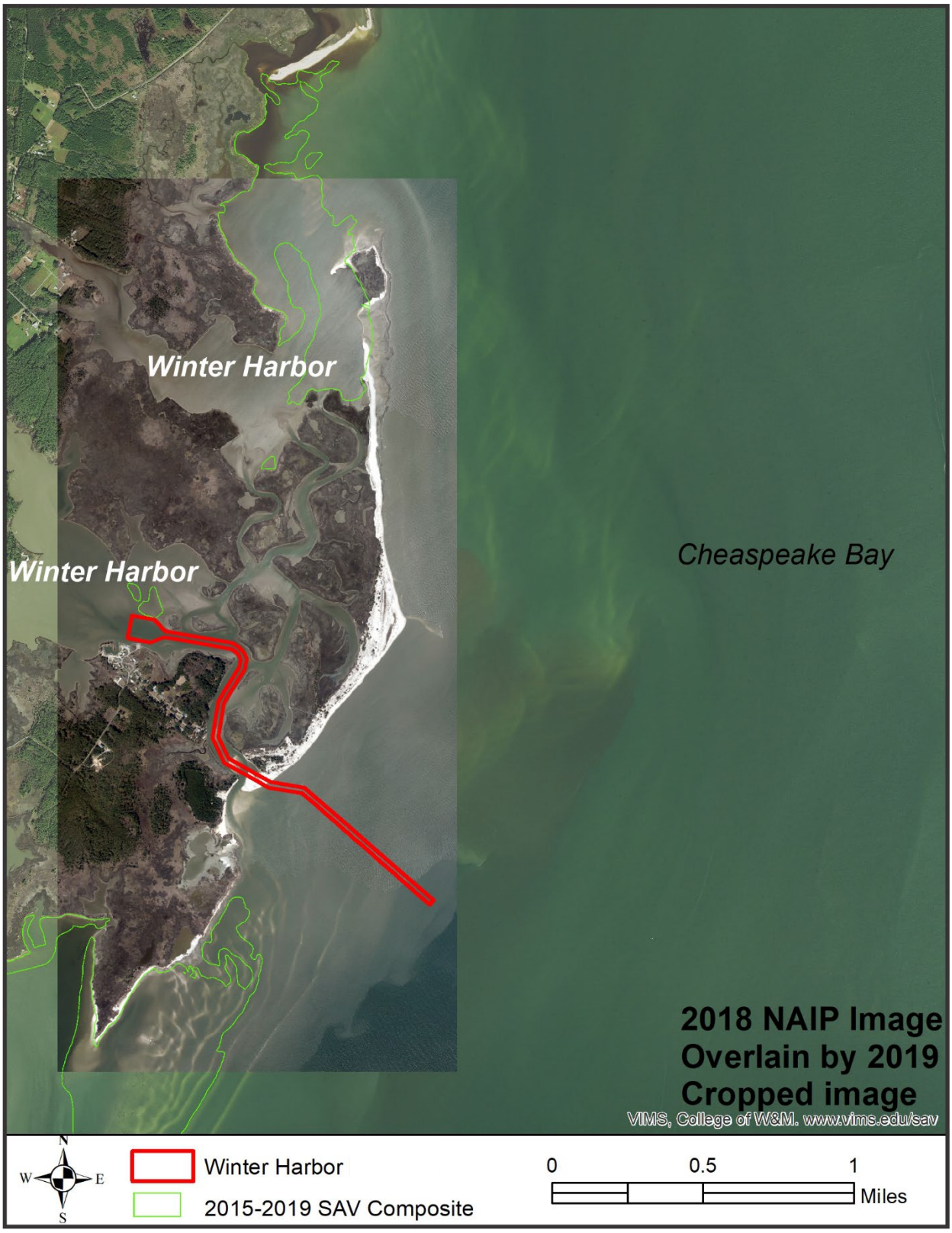


Figure 16. Submerged aquatic vegetation (SAV) in Winter Harbor and surrounding areas.

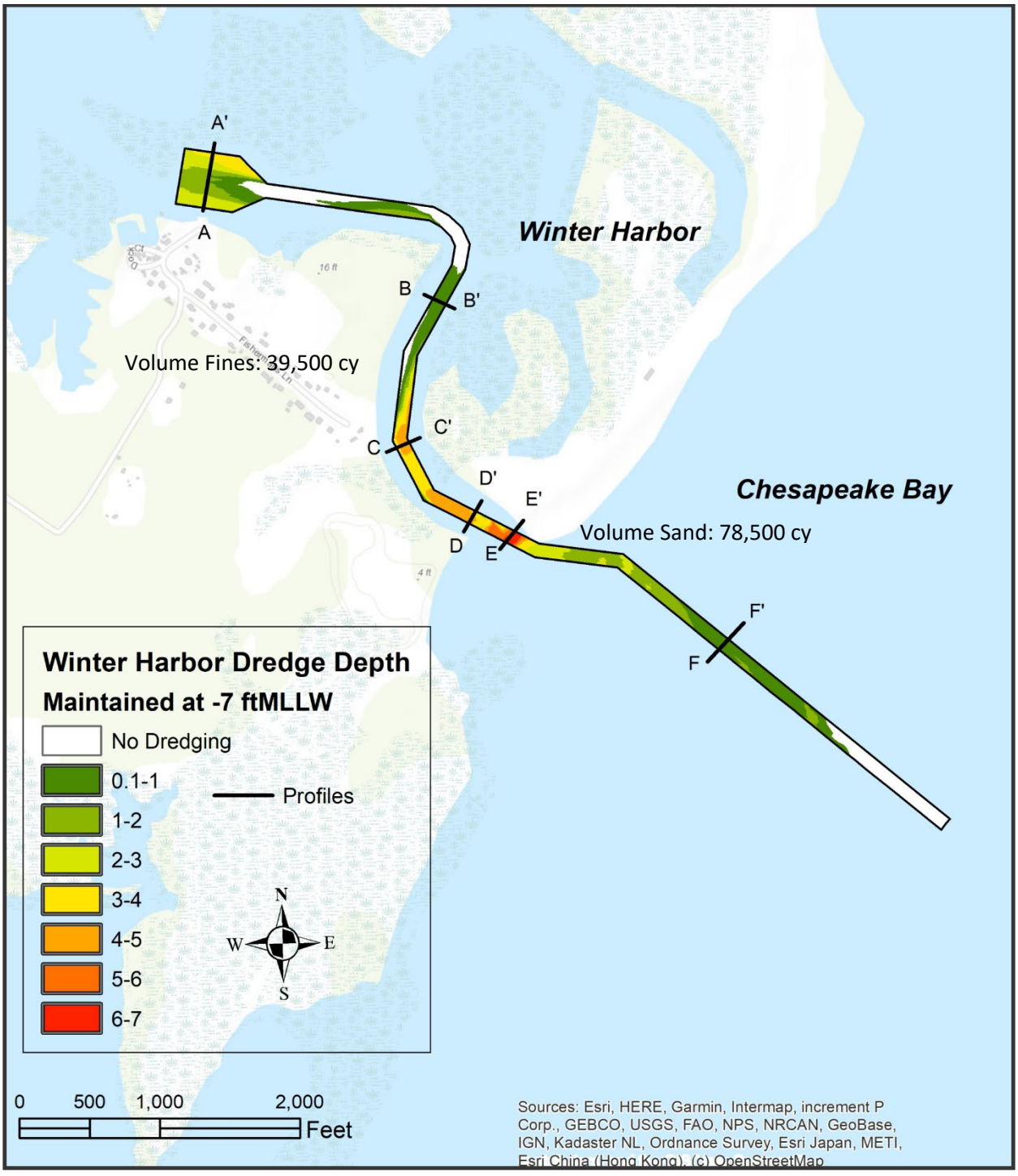


Figure 17. Digital elevation model (DEM) showing the locations in the channel that are shallower than -7 ft MLLW. Areas that need more material removed are shown in red. Areas that need less material removed are shown in green. Areas deeper than -7 ft MLLW are shown in white because there is no dredging needed. Also shown are the typical cross-sections of the channel.

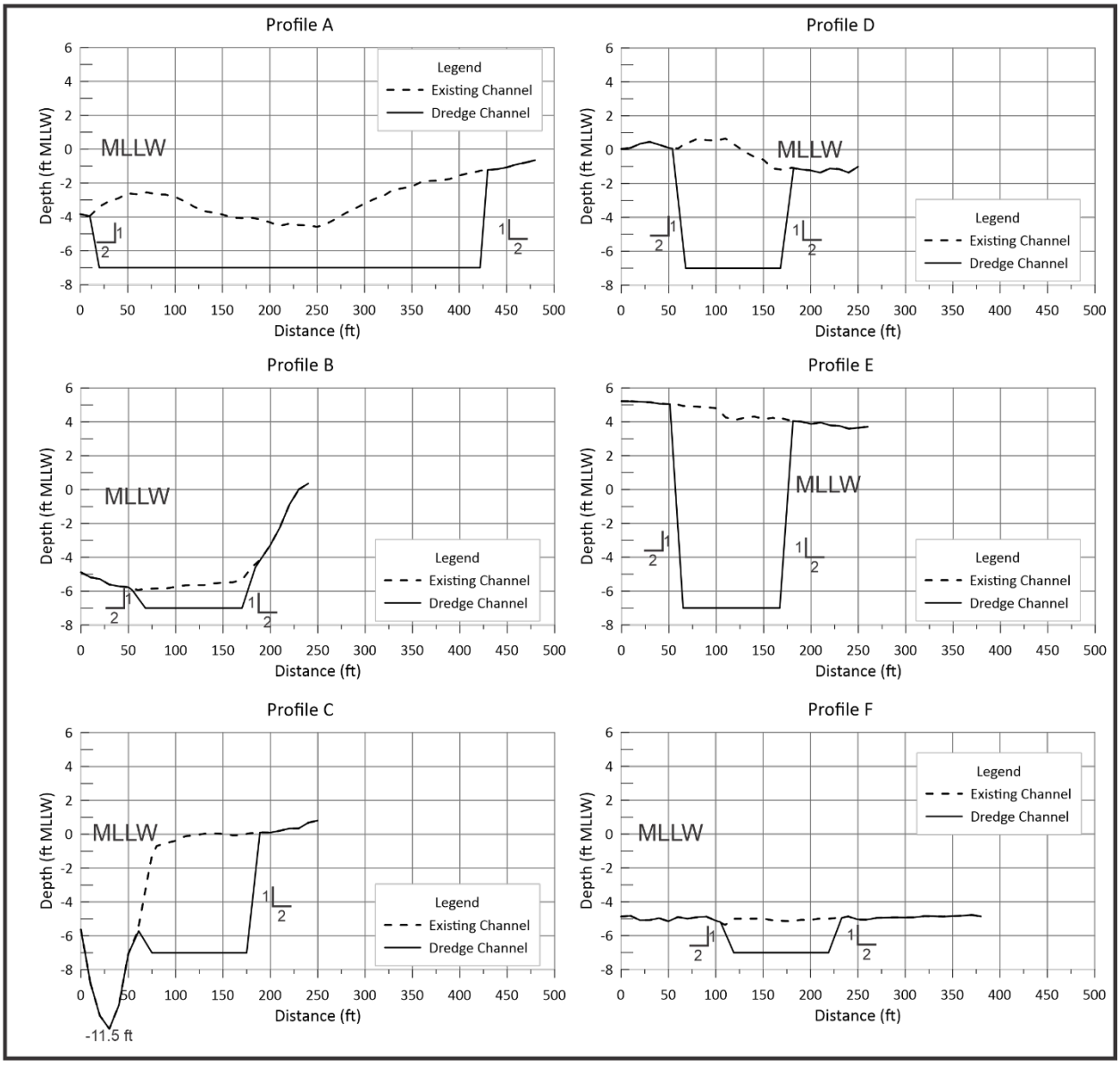


Figure 18. Typical channel cross-sections looking up-creek at Winter Harbor. Their location is shown on Figure 17.

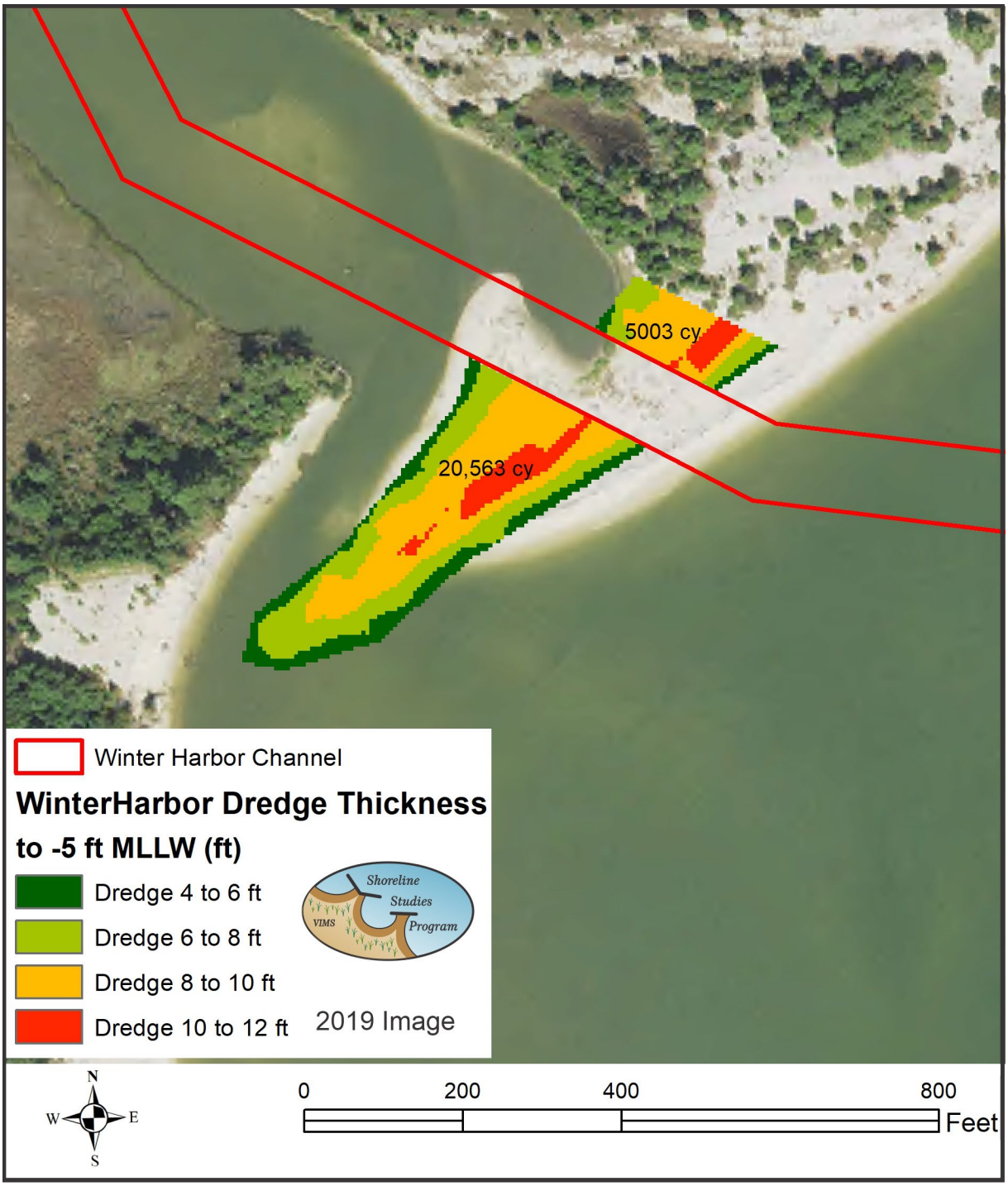


Figure 19. Location and dredge volumes of advance maintenance dredging. Volumes were calculated to a dredge depth of -5 ft MLLW.

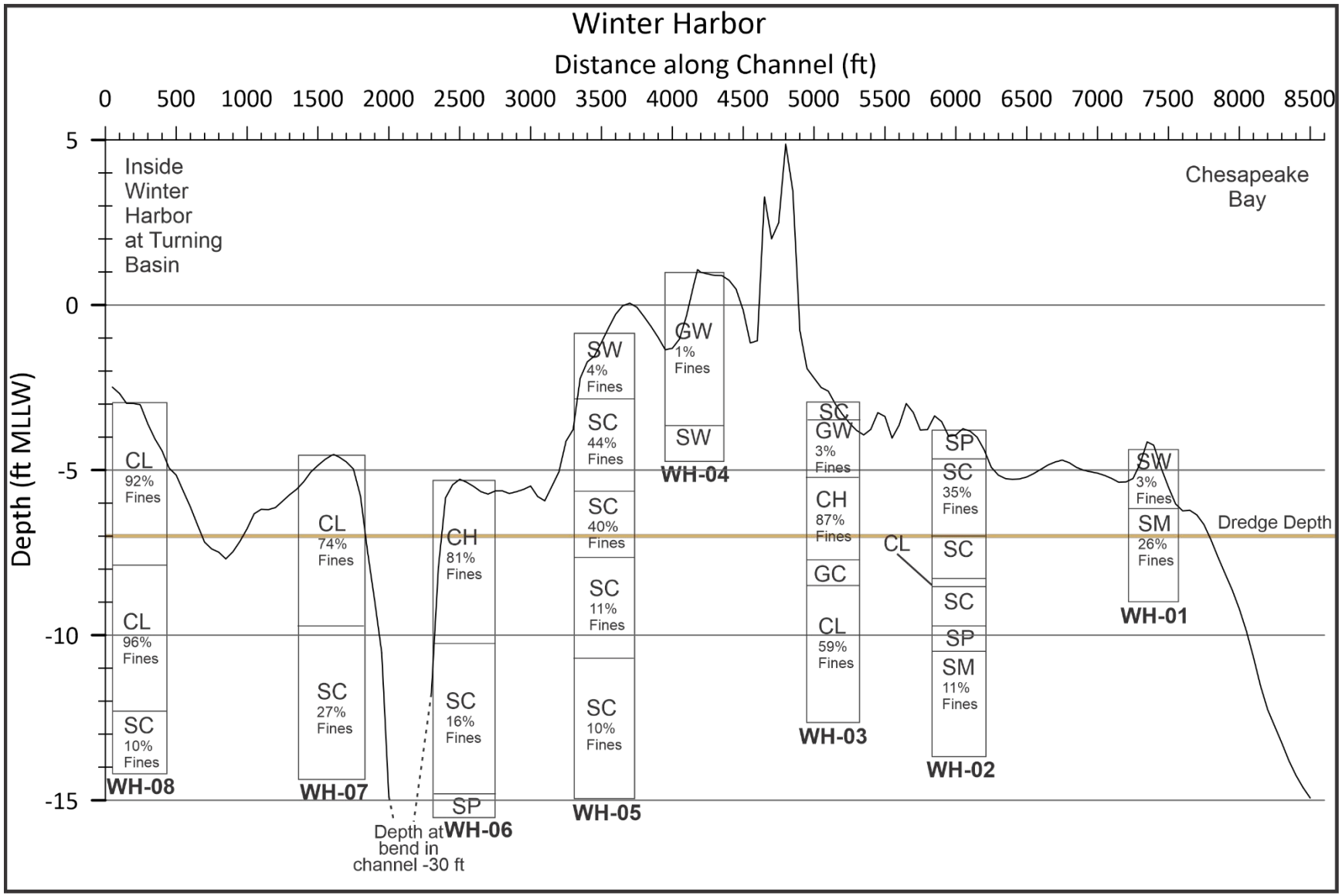


Figure 20. Along-channel cross-section showing the position of the cores and the type of material in the core. The dredge depth is -7 ft MLLW.

Figure 21. Location of federal easements for use with dredge material disposal. From the US Army Corps of Engineers.

Figure 22. Proposed placement for sandy material beneficial use and proposed nearshore breakwater. The inset shows location relative to the channel. Pumping distance is about 1.5 miles.

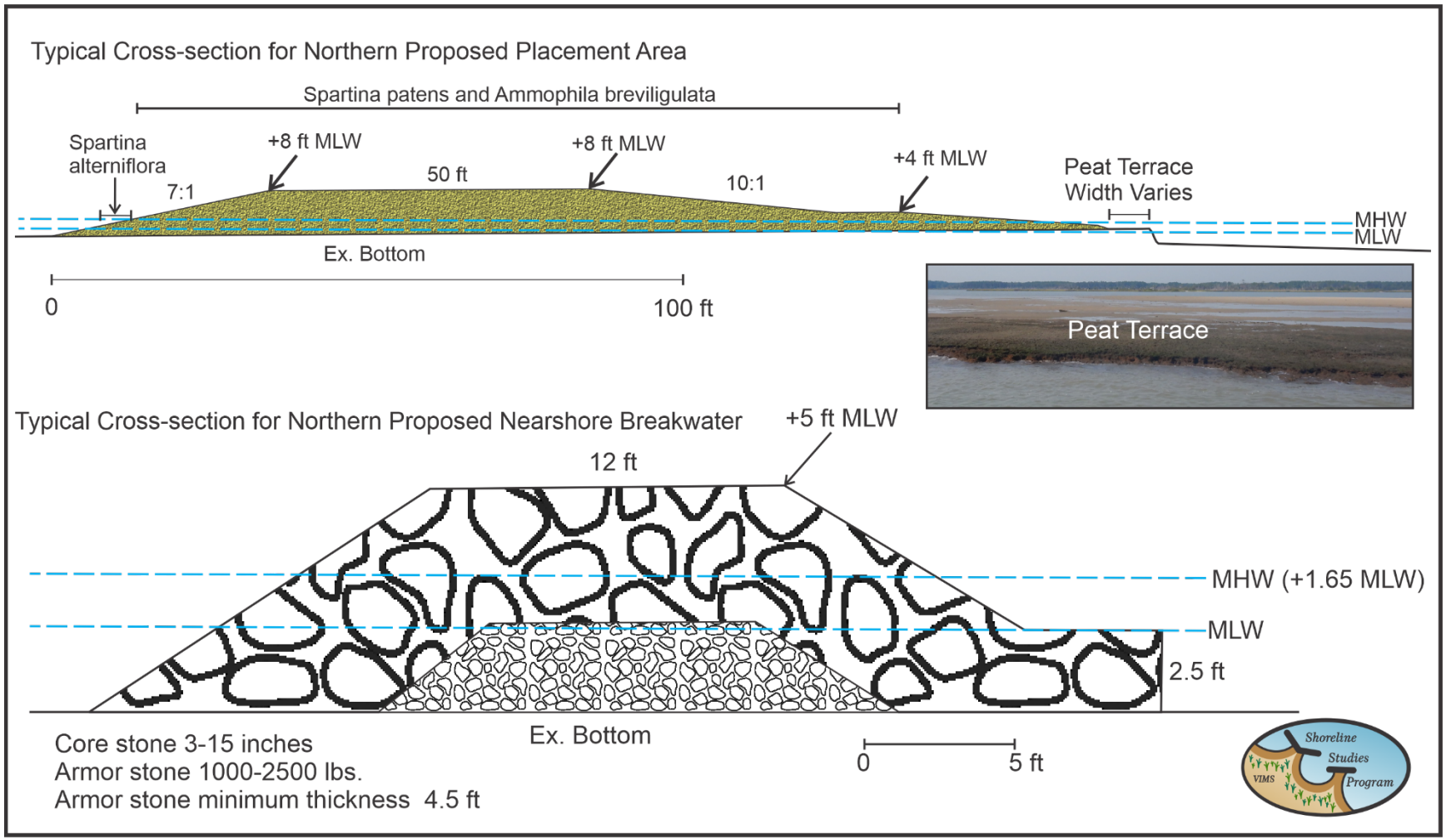


Figure 23. Typical cross-section of proposed placement of sandy dredge material to the north and a proposed structure to slow the material southward transit.

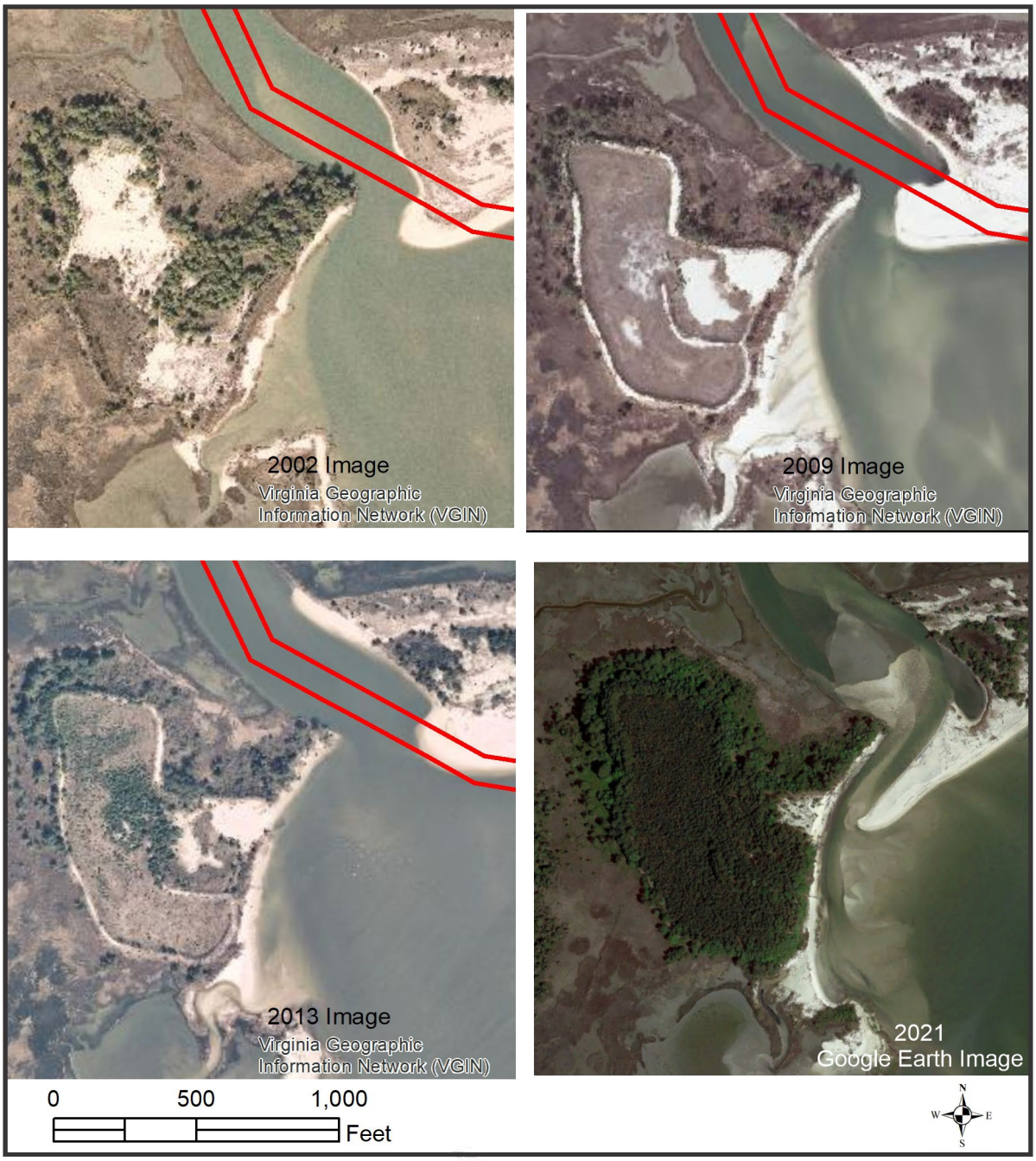
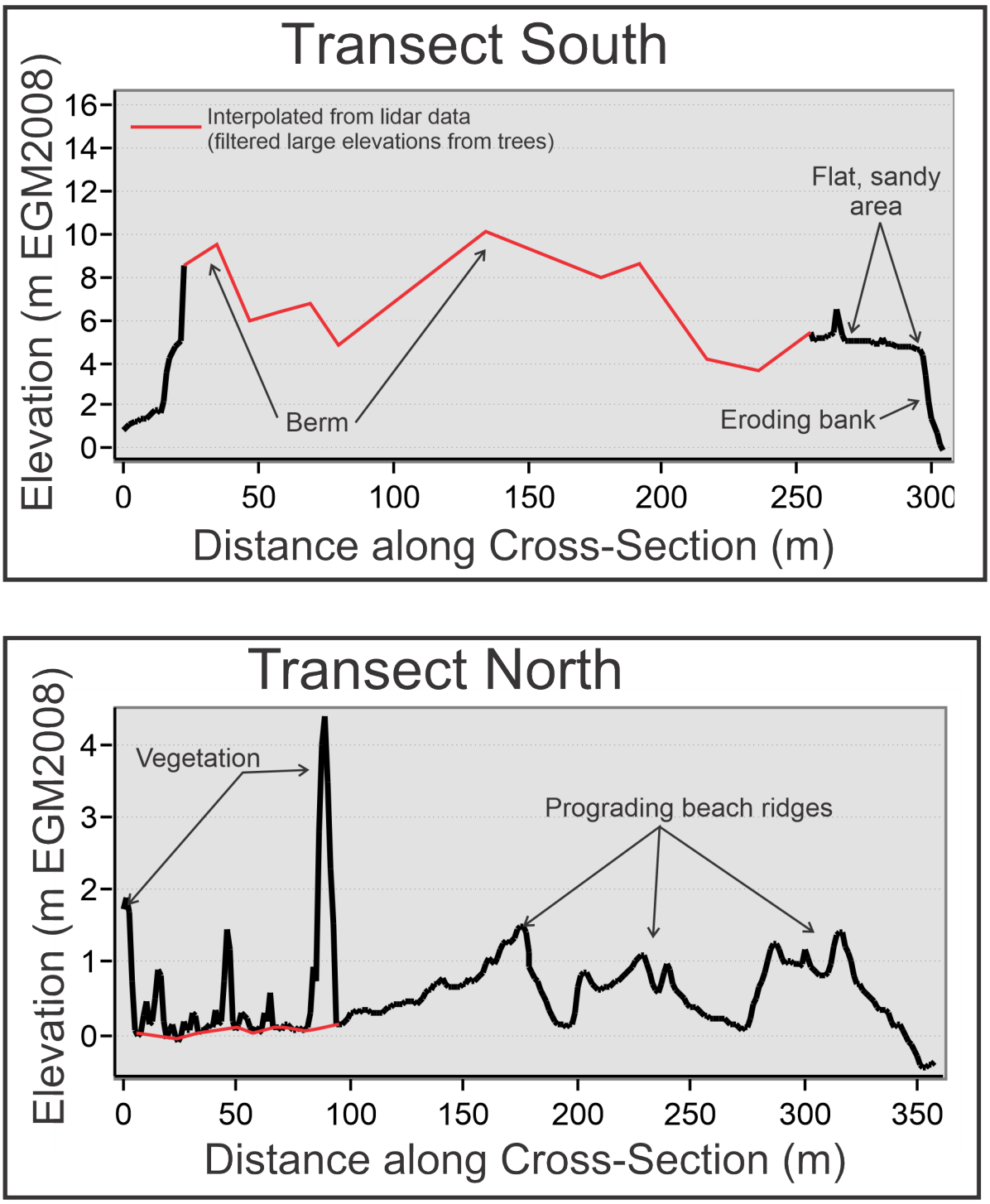


Figure 24. Aerial photos between 2002 and 2021 showing the state of the upland disposal site at Winter Harbor.

Figure 25. Ground photos showing the state of the berm and the outfall pipe. Photo credit: VIMS, Shoreline Studies Program.



EGM2008 is about 1.3 m above MLW at Winter Harbor

Figure 26. Transects obtained from the lidar data taken at the site. The dense vegetation could not be penetrated in some areas, and transect data were interpolated to show the ground rather than the top of the vegetation. The red line shows the approximate elevations of the ground.

Figure 27. Ground photos showing the eroding bank and sand flat. Photo credit: VIMS, Shoreline Studies Program.

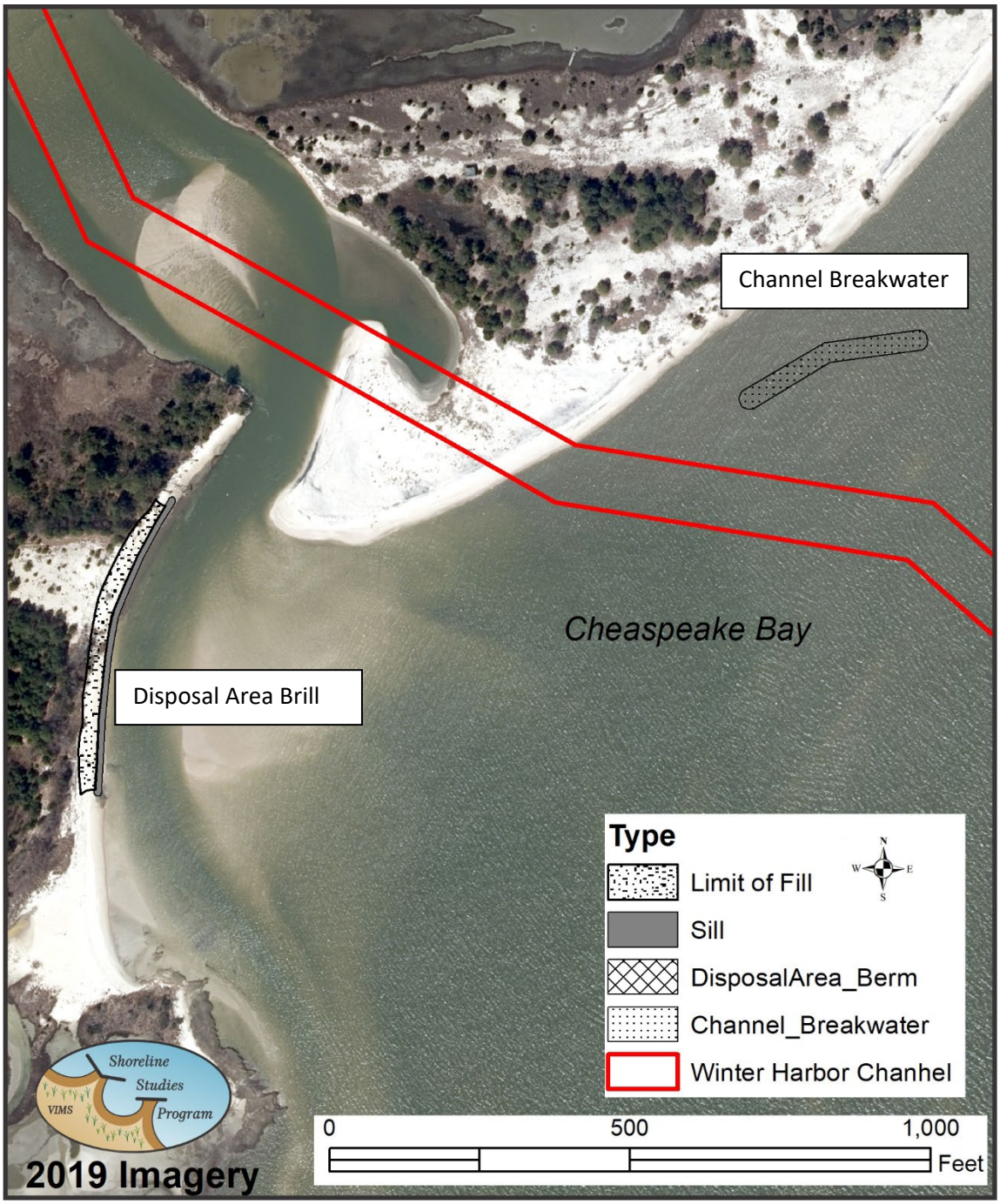


Figure 28. Proposed placement of nearshore breakwater north of the channel and the brill at the eroding bank south of the channel.

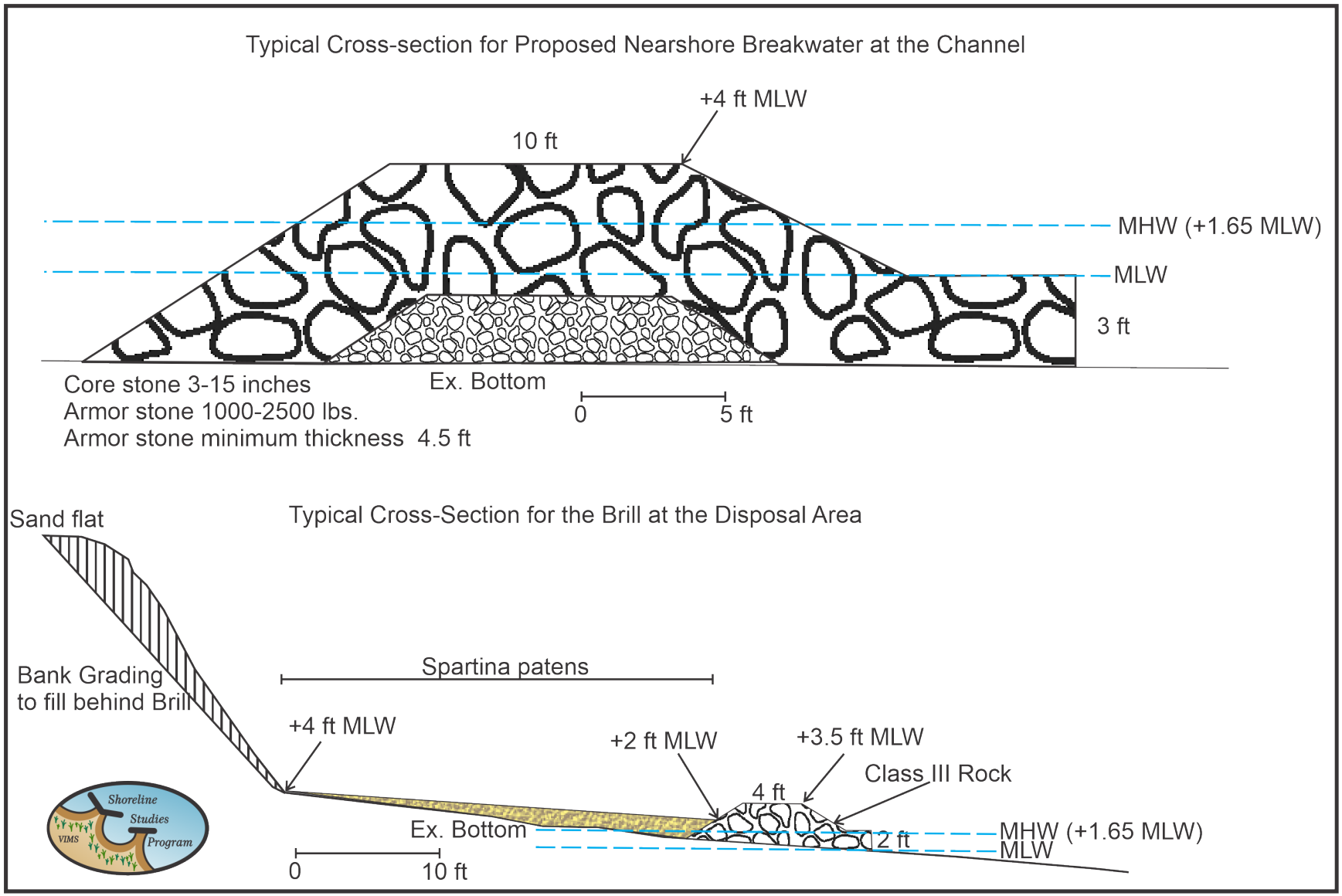


Figure 29. Typical cross-sections for the nearshore breakwater just north of the channel and for the Brill in front of the eroding bank at the disposal area.

Figure 30. Change in the marsh mapped between 1937 and 2018 using the Shoreline Studies Program Shore Change Database.

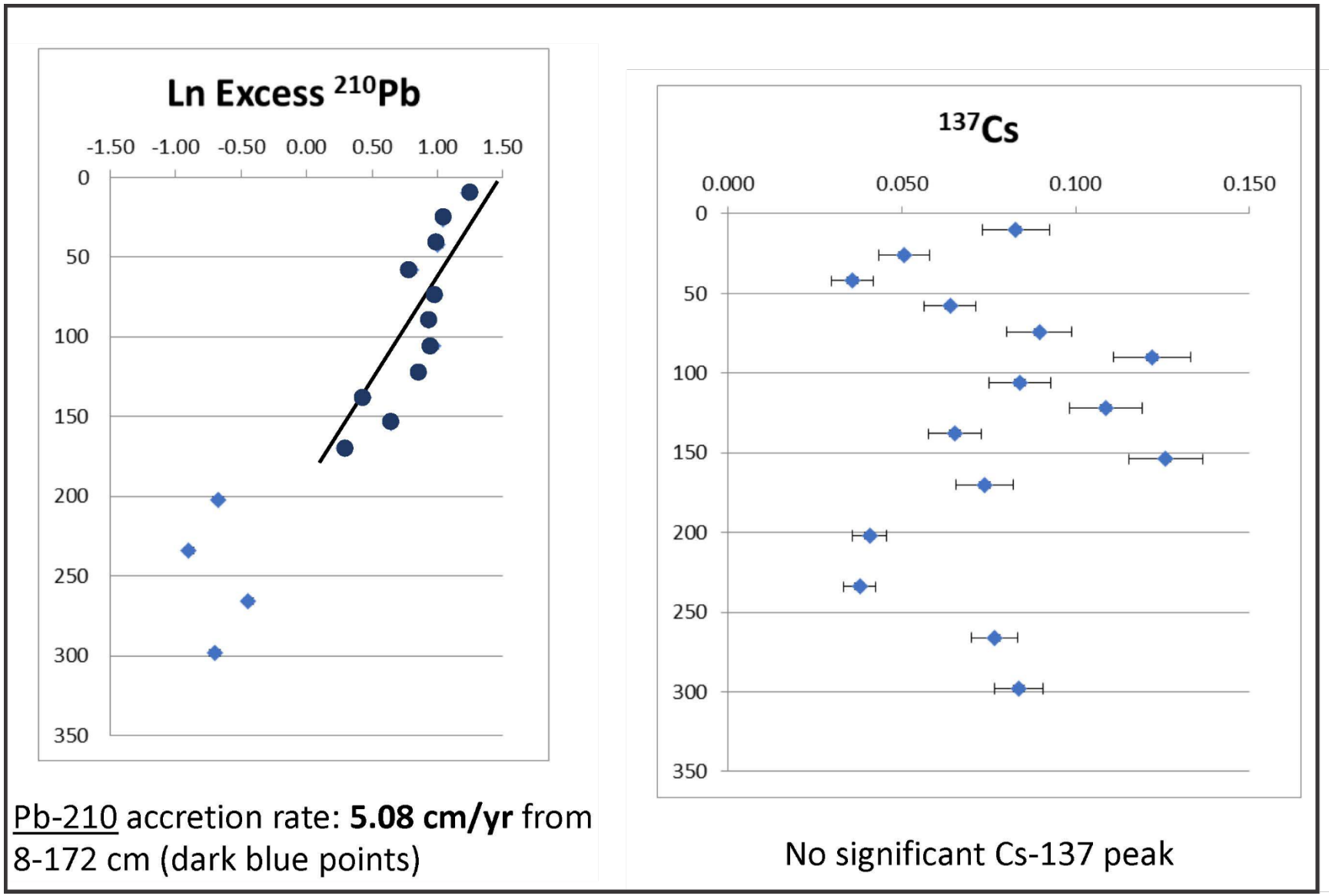


Figure 31. Result plots from the ^{210}Pb and ^{137}Cs testing showing the modeled sedimentation rates.

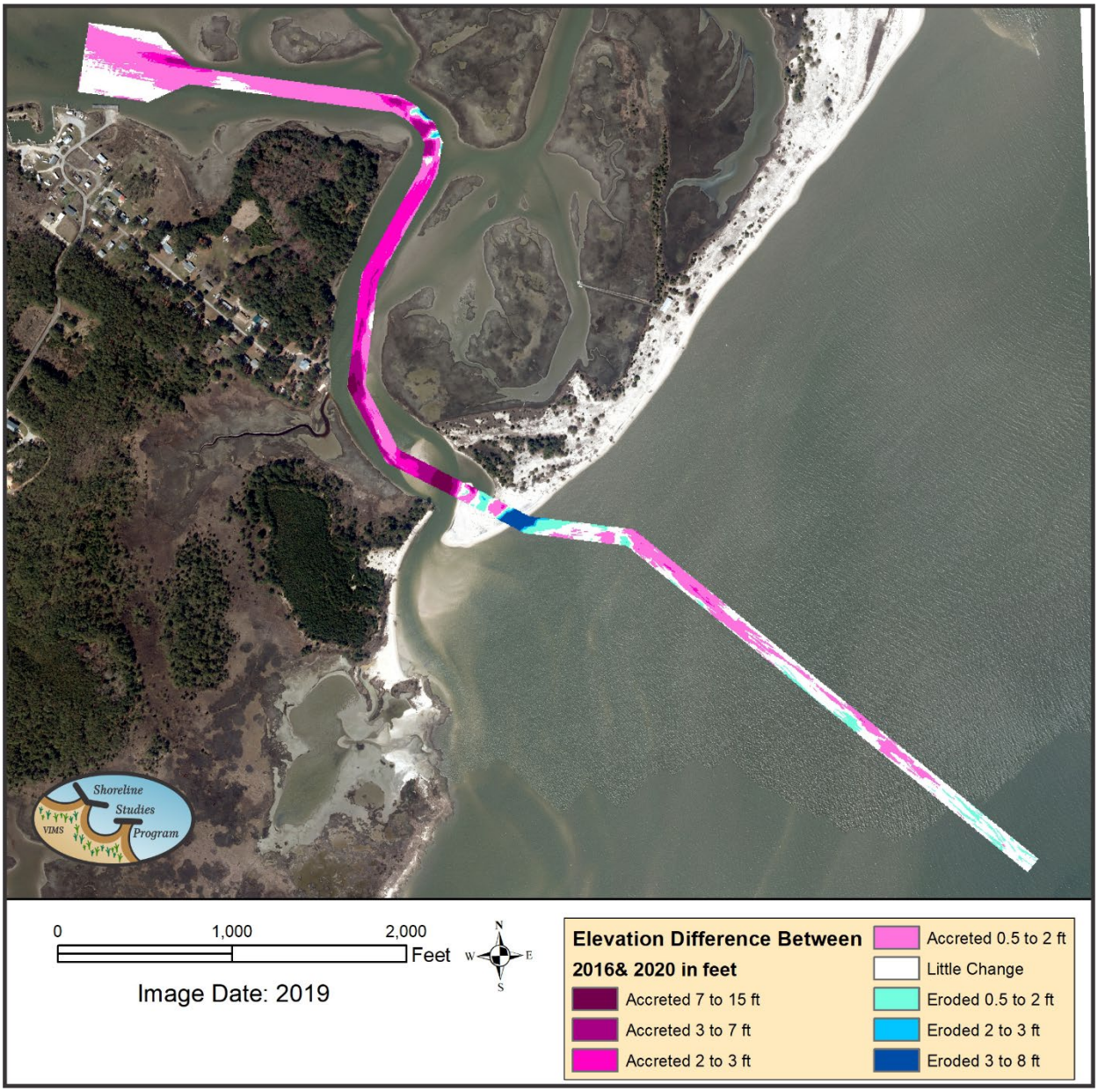
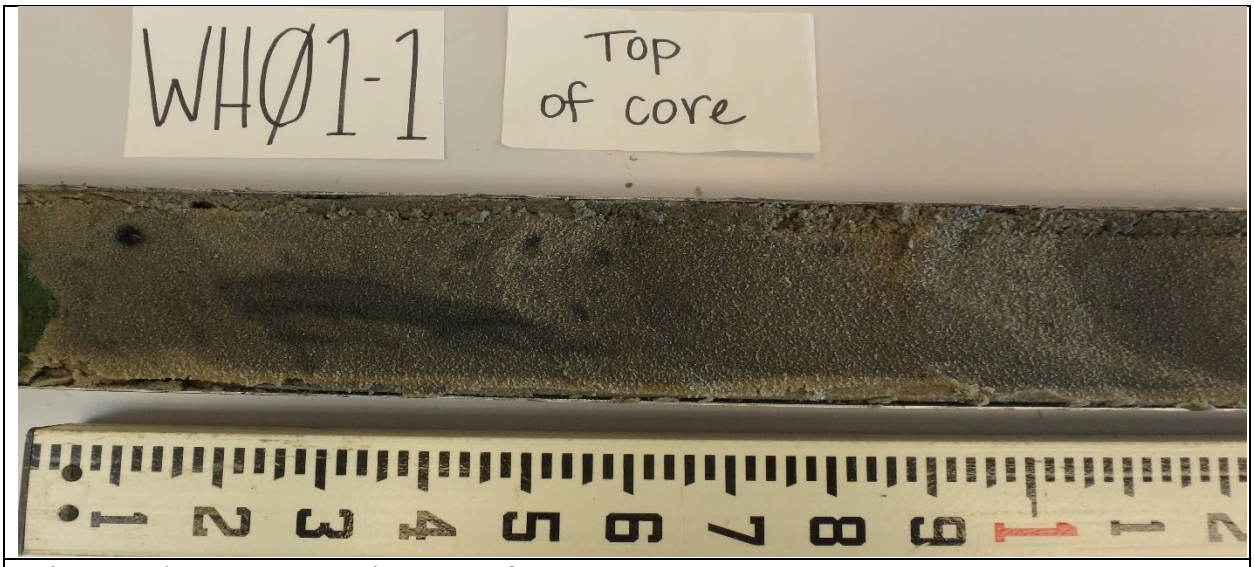


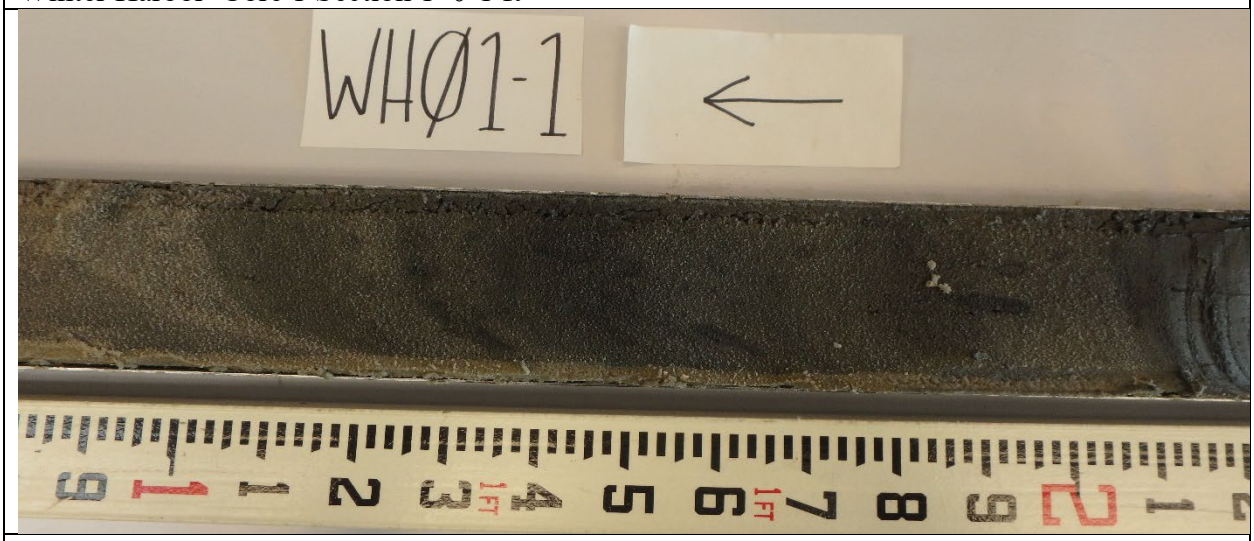
Figure 32. Comparison between the 2016 and 2020 surveys.

Appendix A

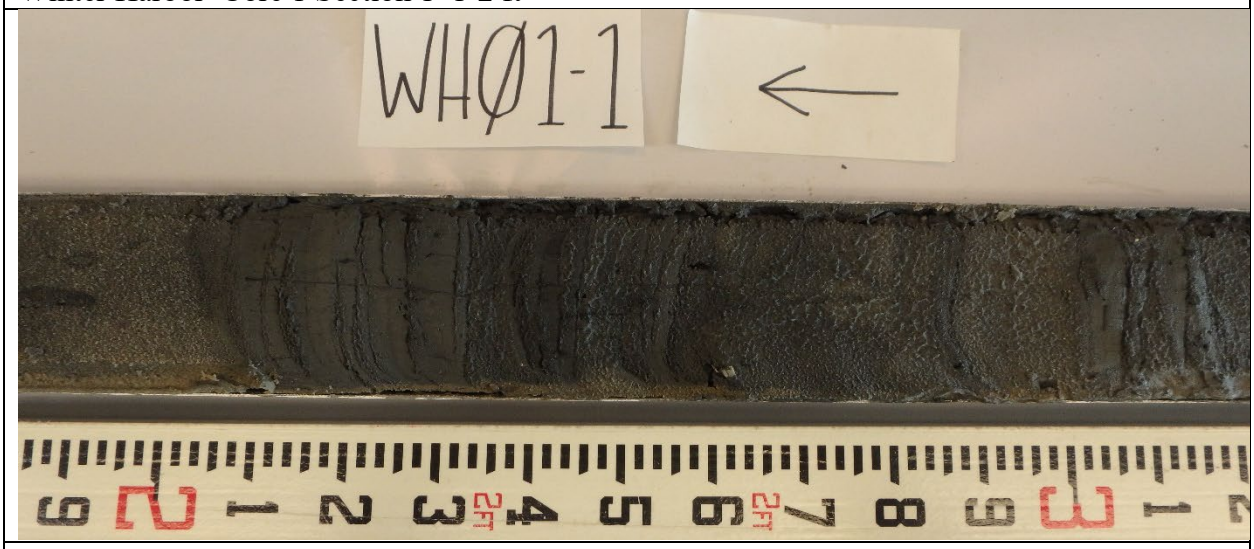
Core Photographs



Winter Harbor Core 1 Section 1 0-1 ft



Winter Harbor Core 1 Section 1 1-2 ft



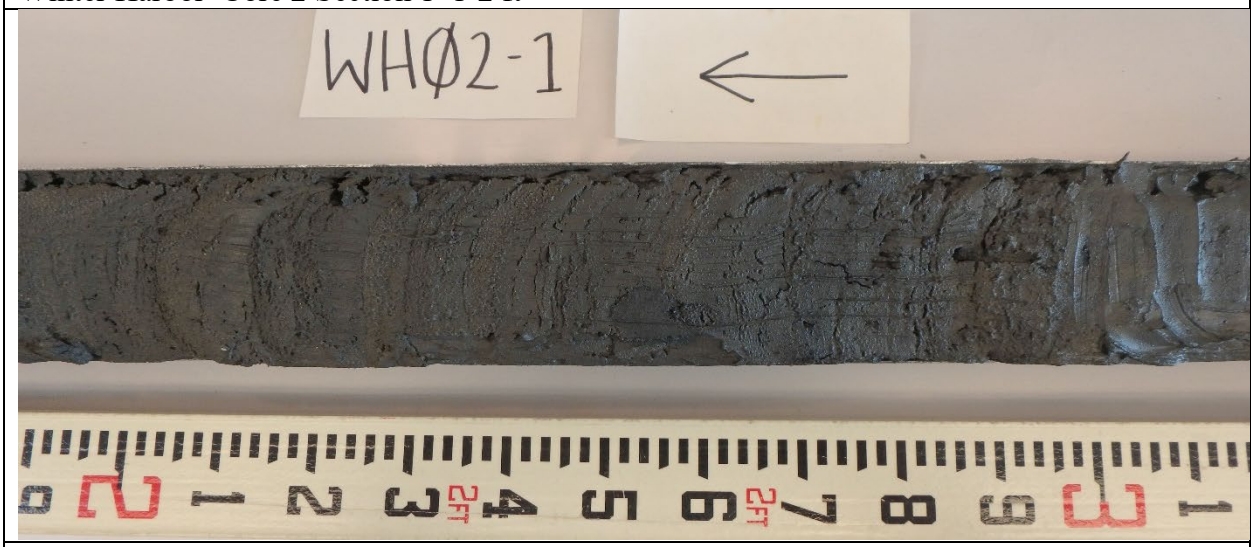
Winter Harbor Core 1 Section 1 2-3 ft

Winter Harbor Core 1 Section 1 3-4 ft

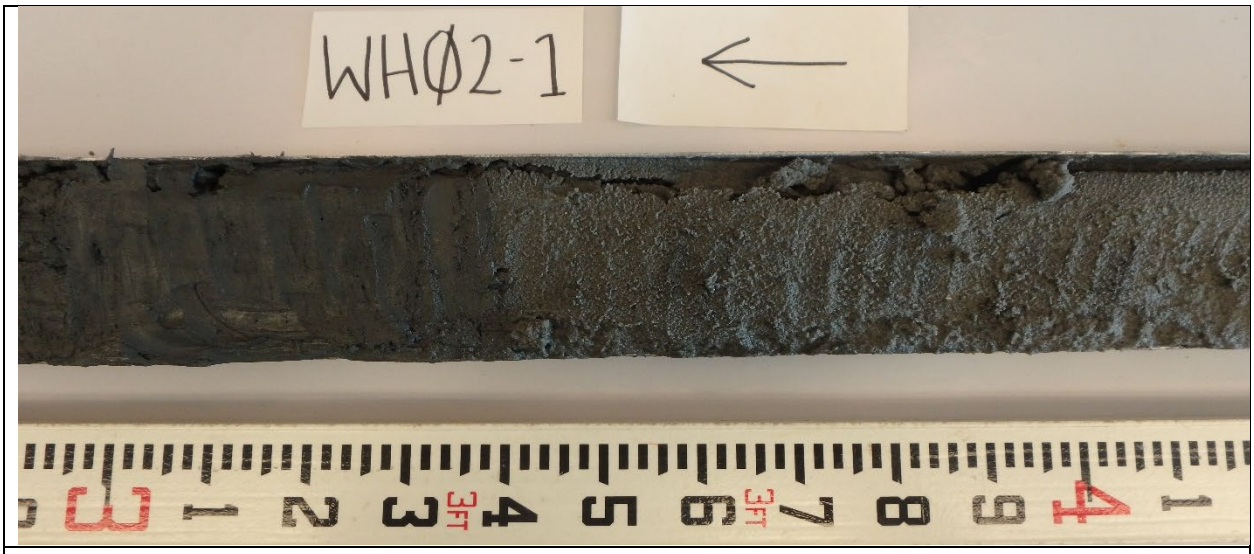
Winter Harbor Core 1 Section 1 3.9-4.6 ft

Winter Harbor Core 2 Section 1 0-1 ft

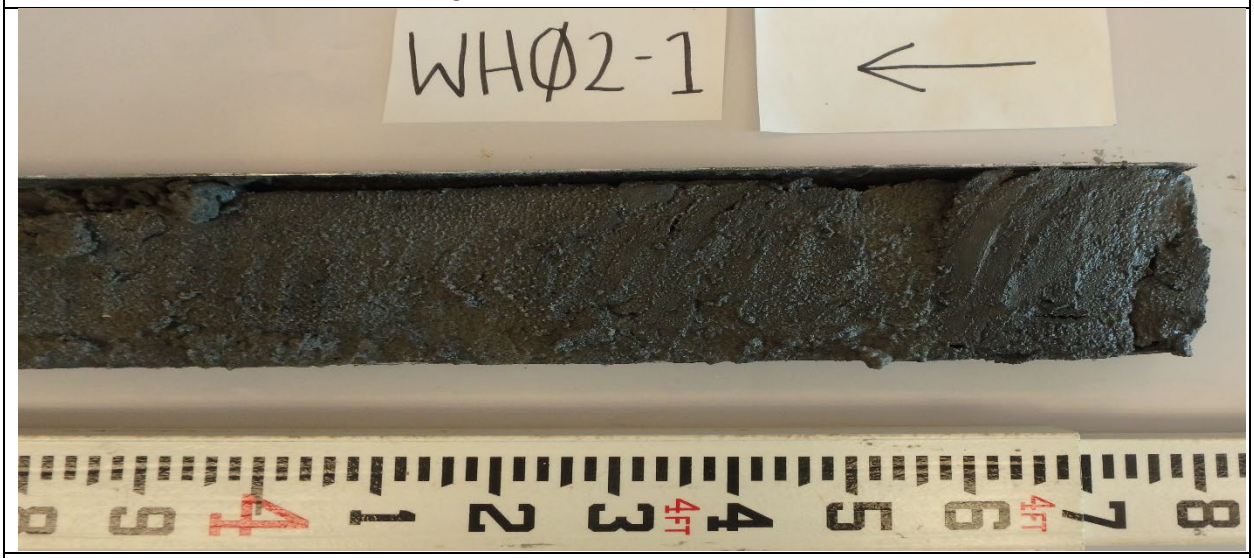
Winter Harbor Core 2 Section 1 1-2 ft



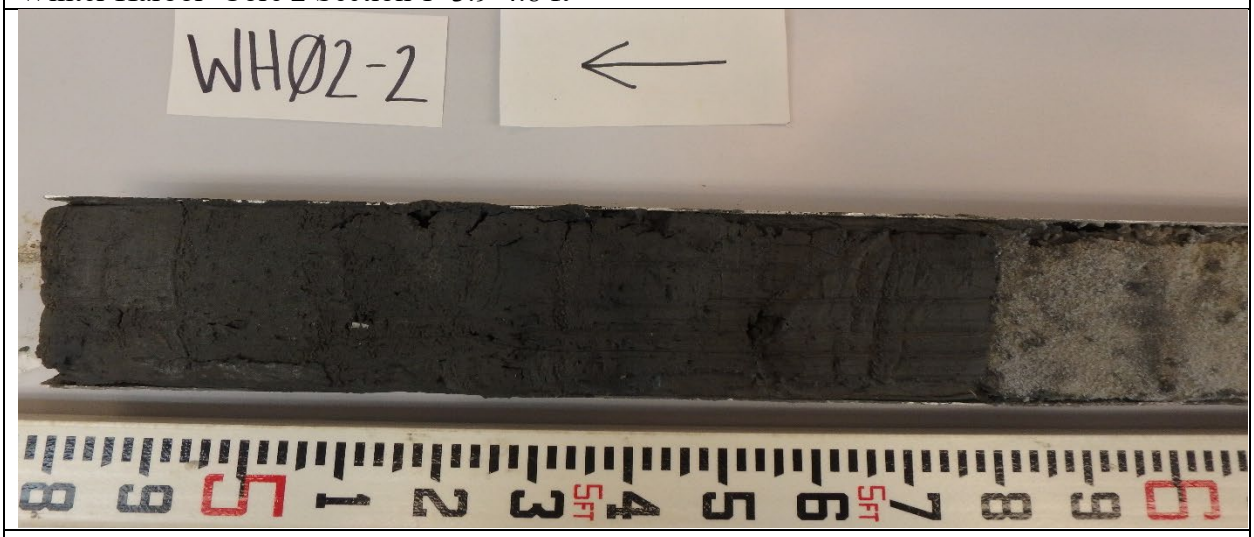
Winter Harbor Core 2 Section 1 2-3 ft



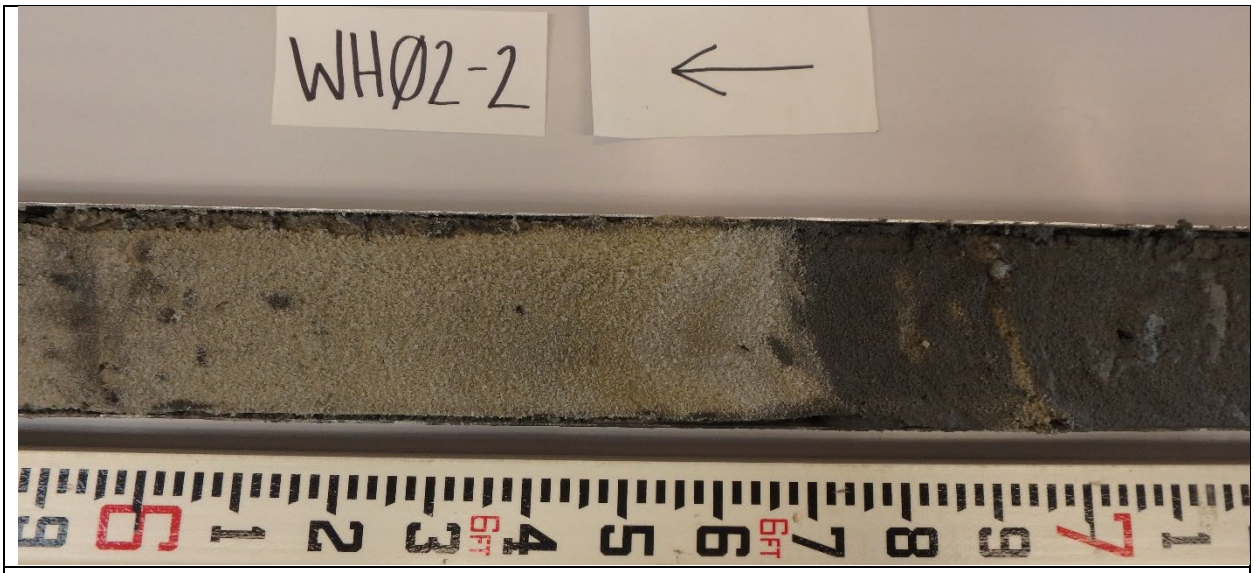
Winter Harbor Core 2 Section 1 3-4 ft



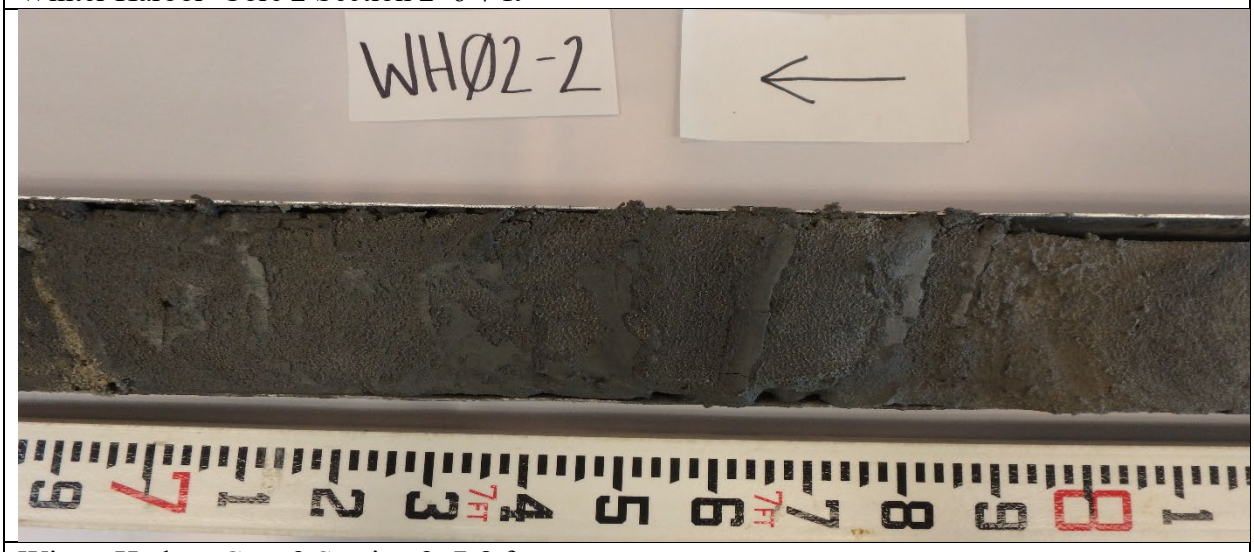
Winter Harbor Core 2 Section 1 3.9-4.8 ft



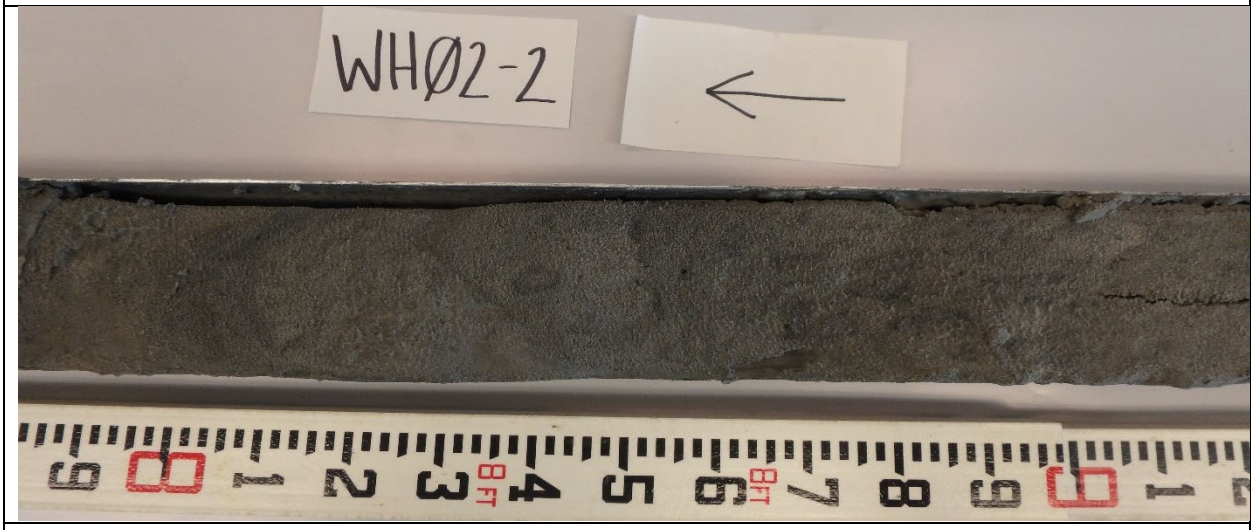
Winter Harbor Core 2 Section 2 4.8-6 ft



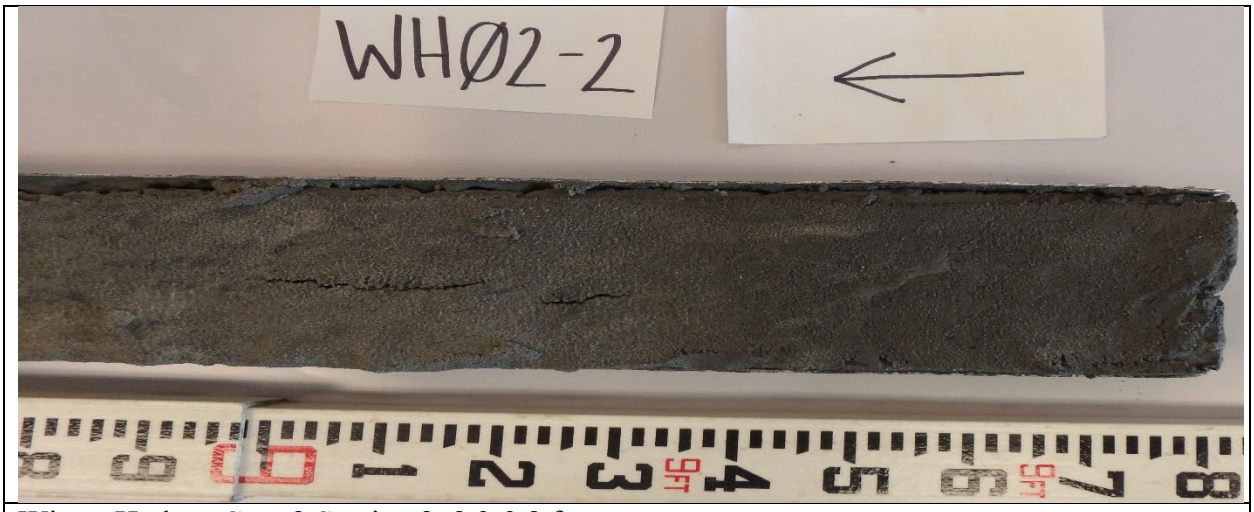
Winter Harbor Core 2 Section 2 6-7 ft



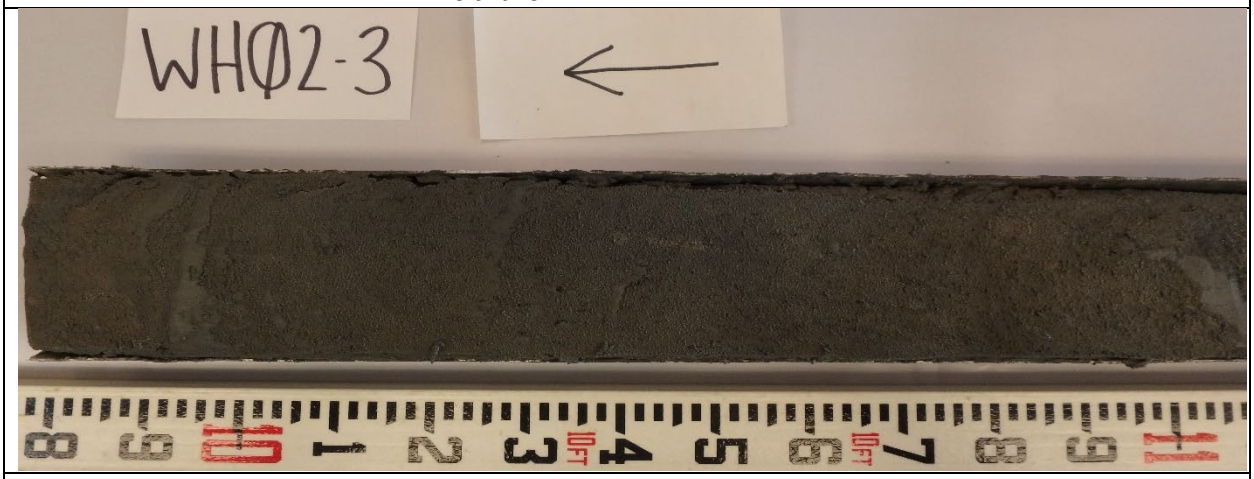
Winter Harbor Core 2 Section 2 7-8 ft



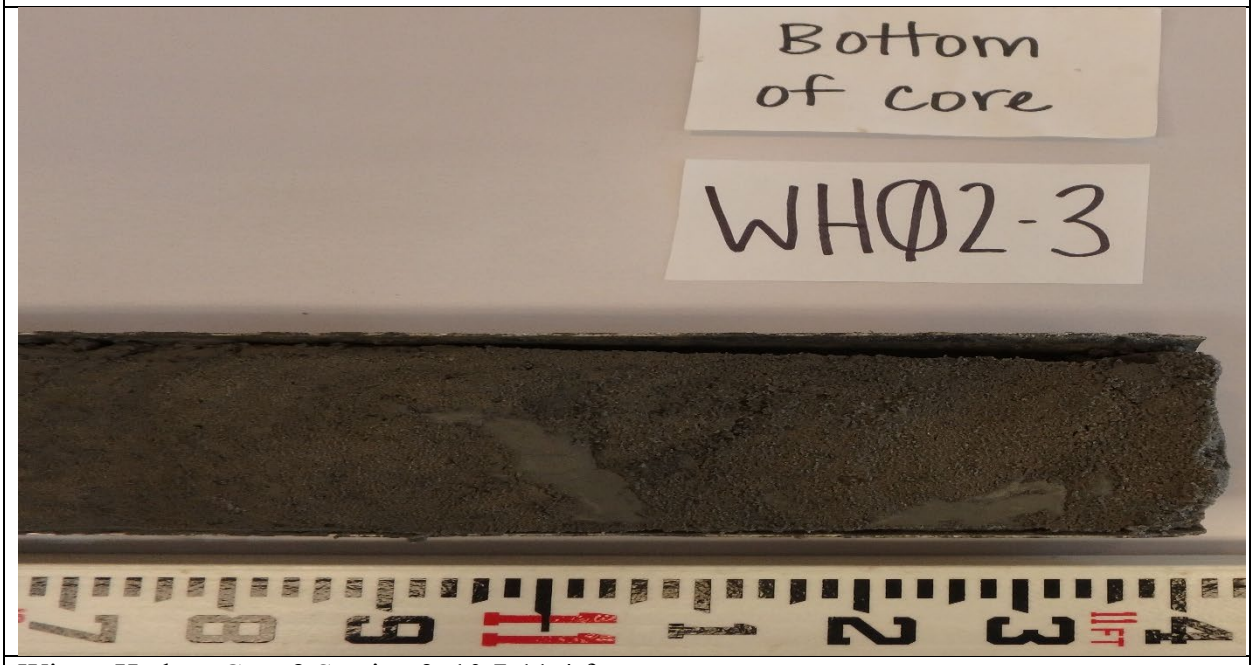
Winter Harbor Core 2 Section 2 8-9 ft



Winter Harbor Core 2 Section 2 8.9-9.8 ft

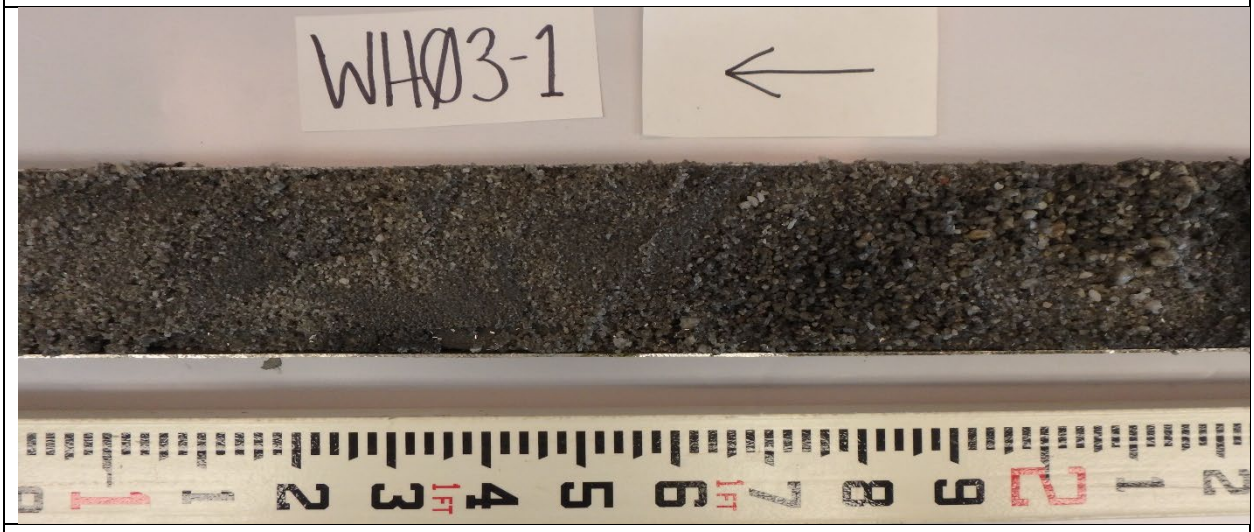


Winter Harbor Core 2 Section 3 9.8-11 ft



Winter Harbor Core 2 Section 3 10.7-11.4 ft

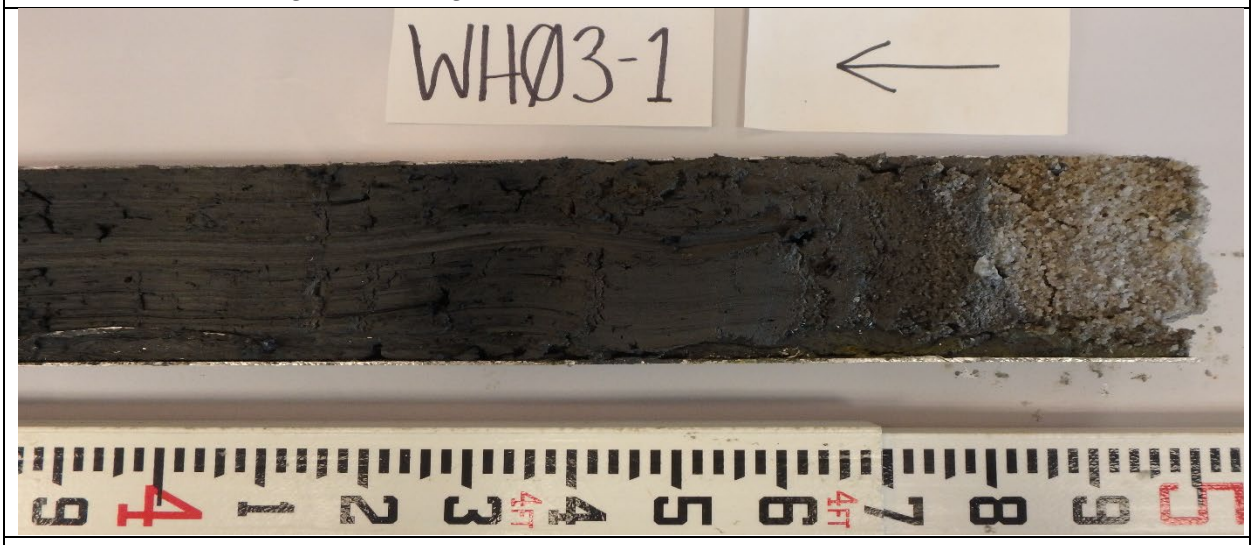
Winter Harbor Core 3 Section 1 0-1 ft



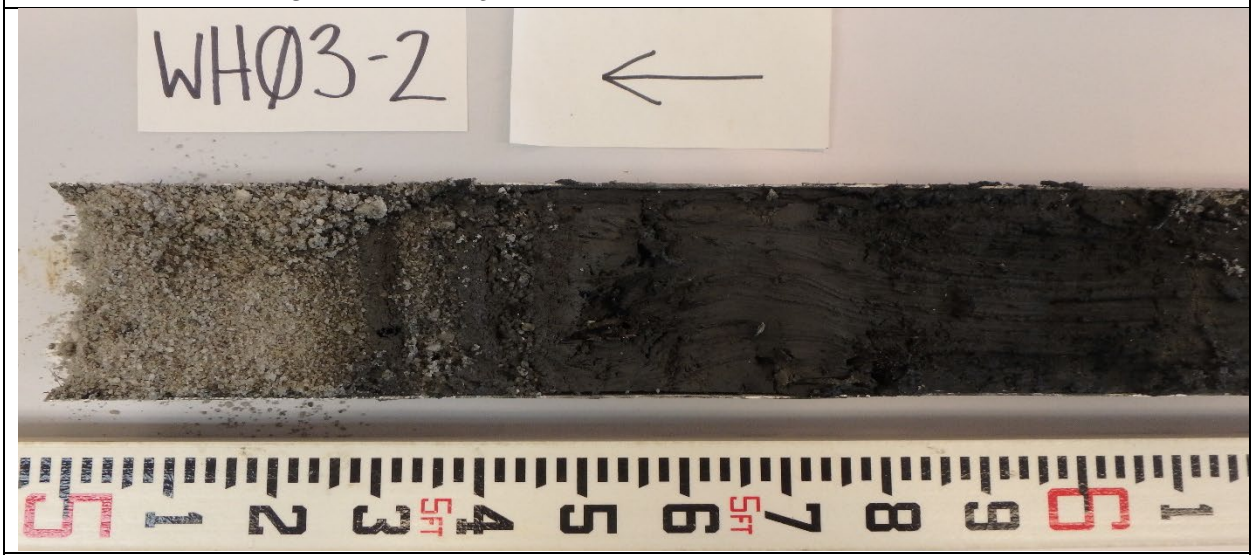
Winter Harbor Core 3 Section 1 1-2 ft

Winter Harbor Core 3 Section 1 2-3 ft

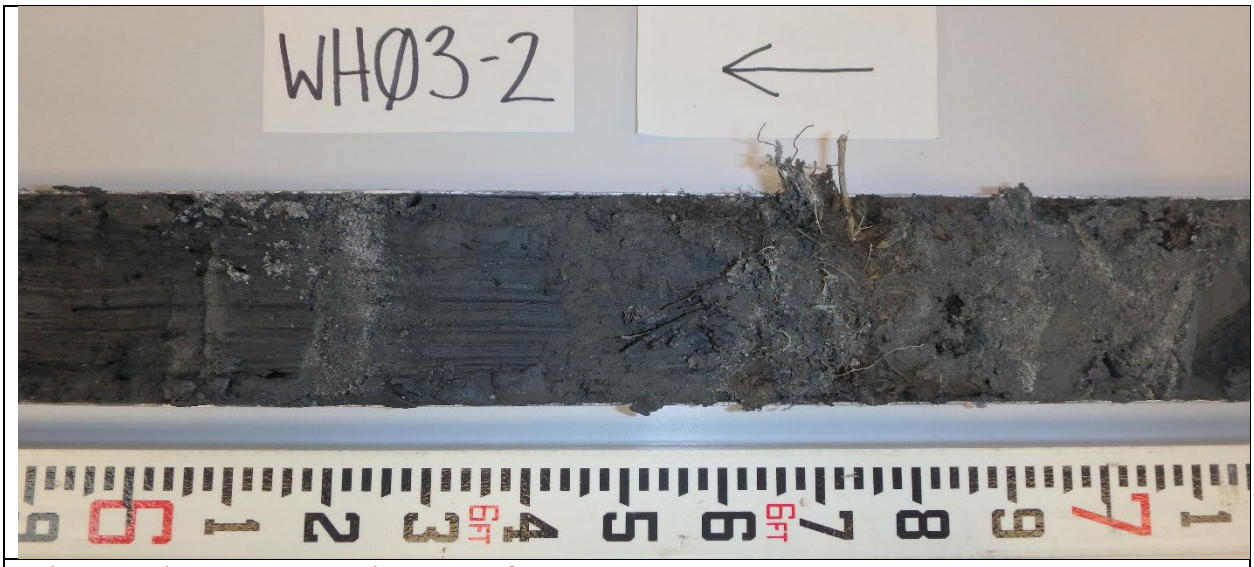
Winter Harbor Core 3 Section 1 3-4 ft



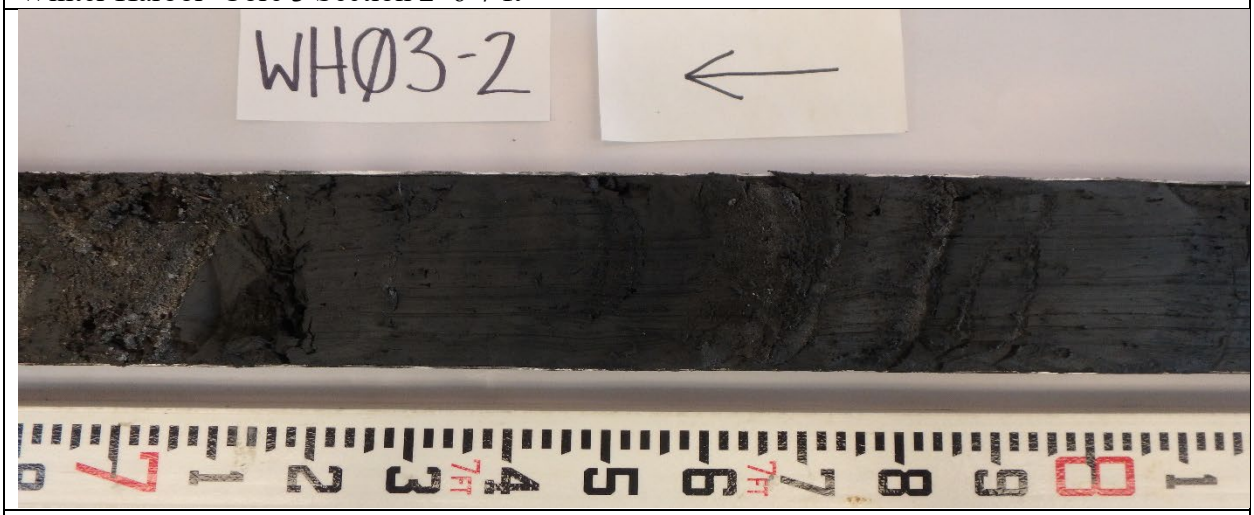
Winter Harbor Core 3 Section 1 4-5 ft



Winter Harbor Core 3 Section 2 5-6 ft



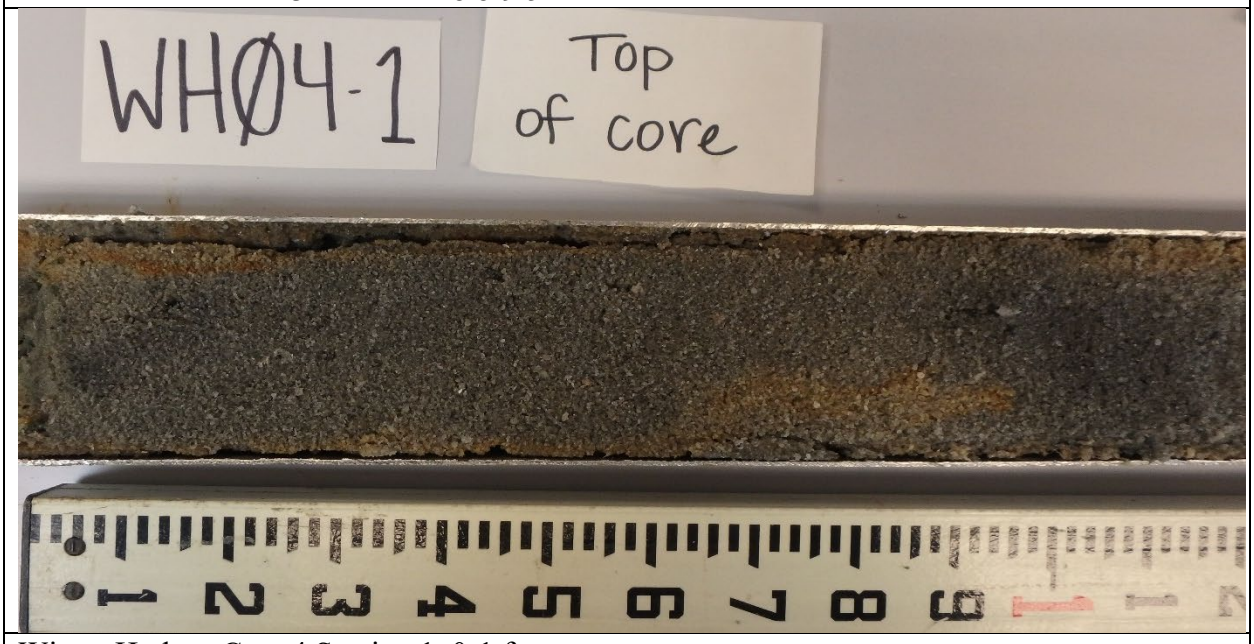
Winter Harbor Core 3 Section 2 6-7 ft



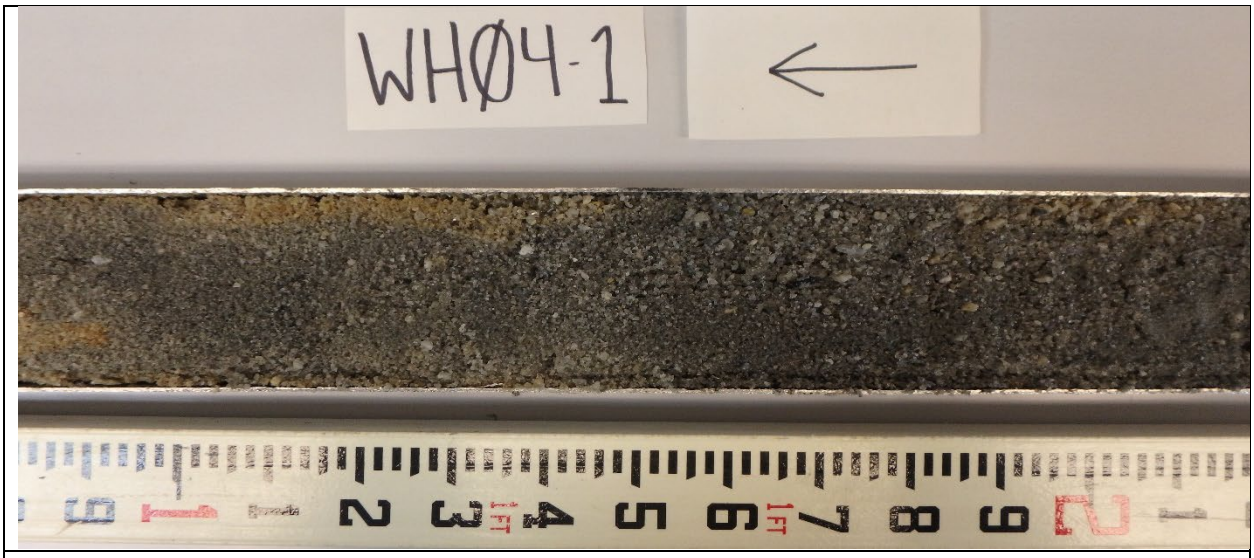
Winter Harbor Core 3 Section 2 7-8 ft

Winter Harbor Core 3 Section 2 8-9 ft

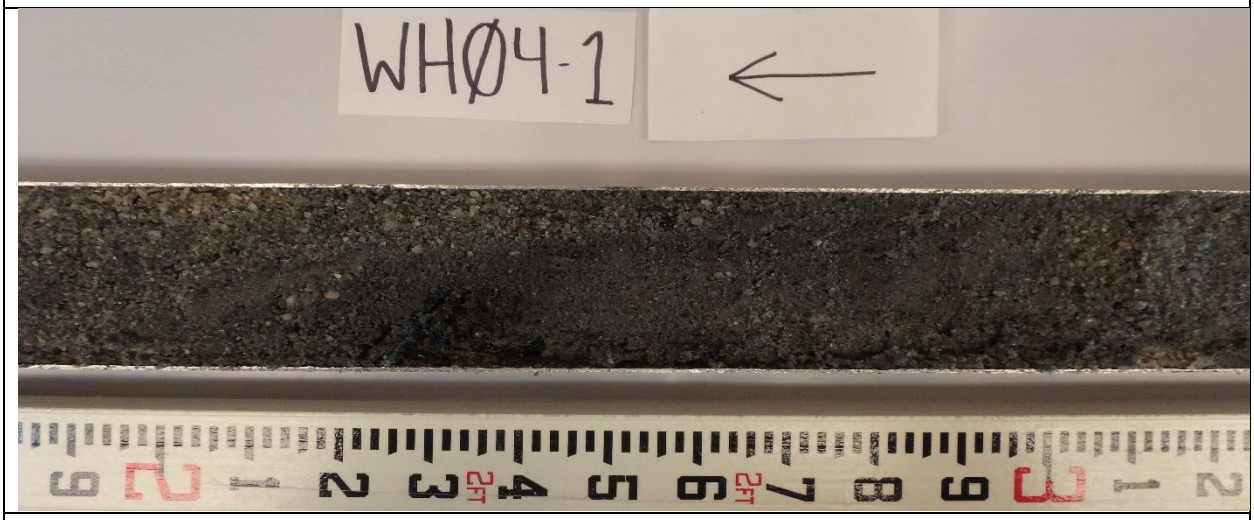
Winter Harbor Core 3 Section 2 8.8-9.5 ft



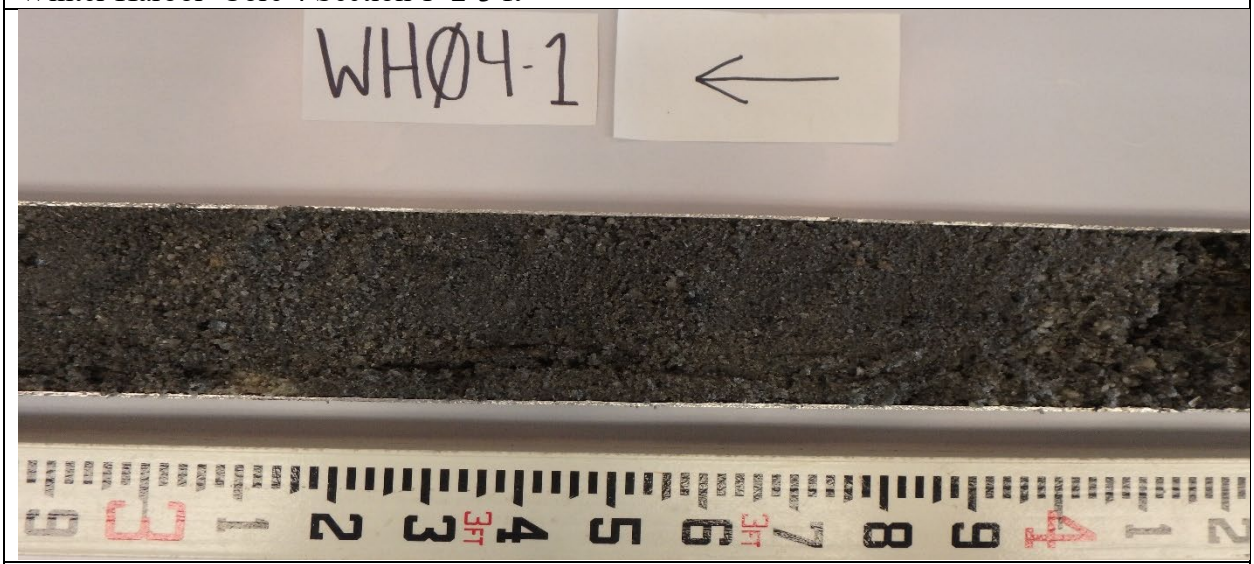
Winter Harbor Core 4 Section 1 0-1 ft



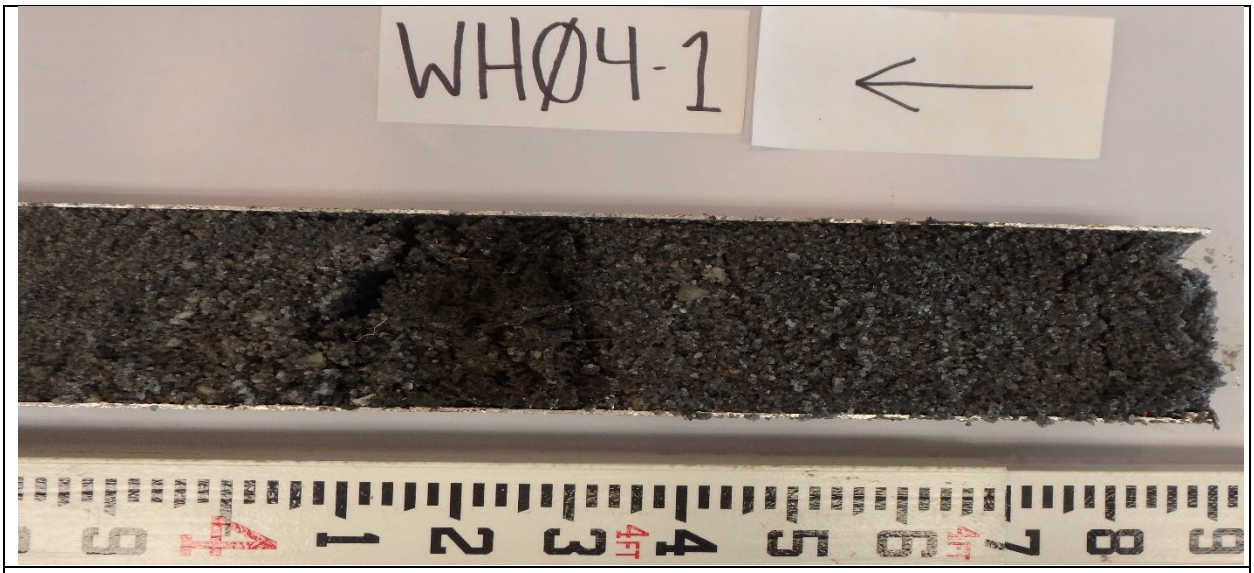
Winter Harbor Core 4 Section 1 1-2 ft



Winter Harbor Core 4 Section 1 2-3 ft

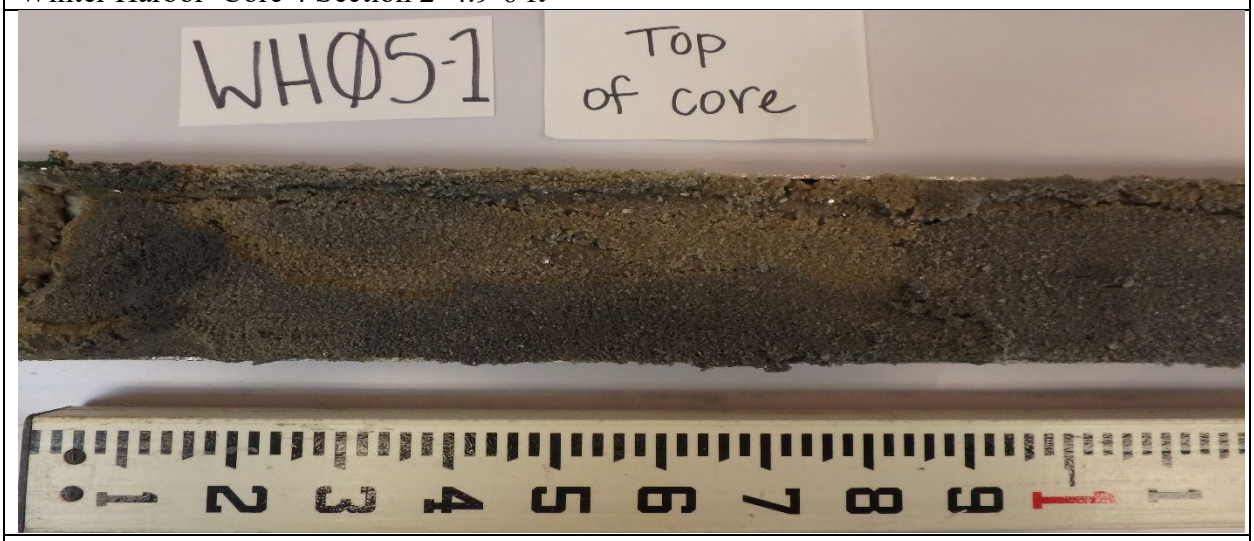


Winter Harbor Core 4 Section 1 3-4 ft

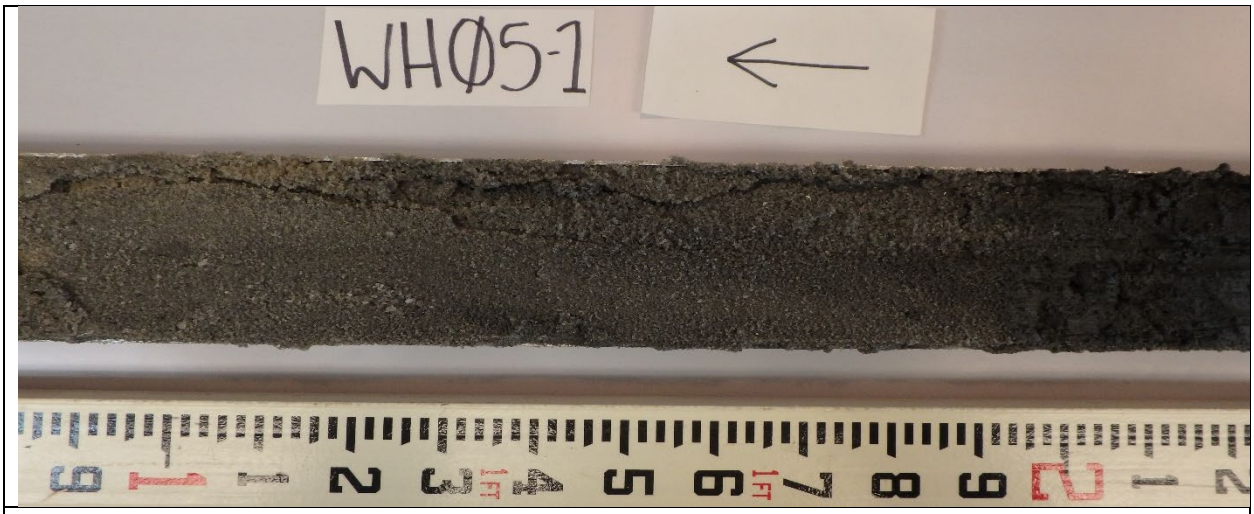


Winter Harbor Core 4 Section 1 3.9-4.9 ft

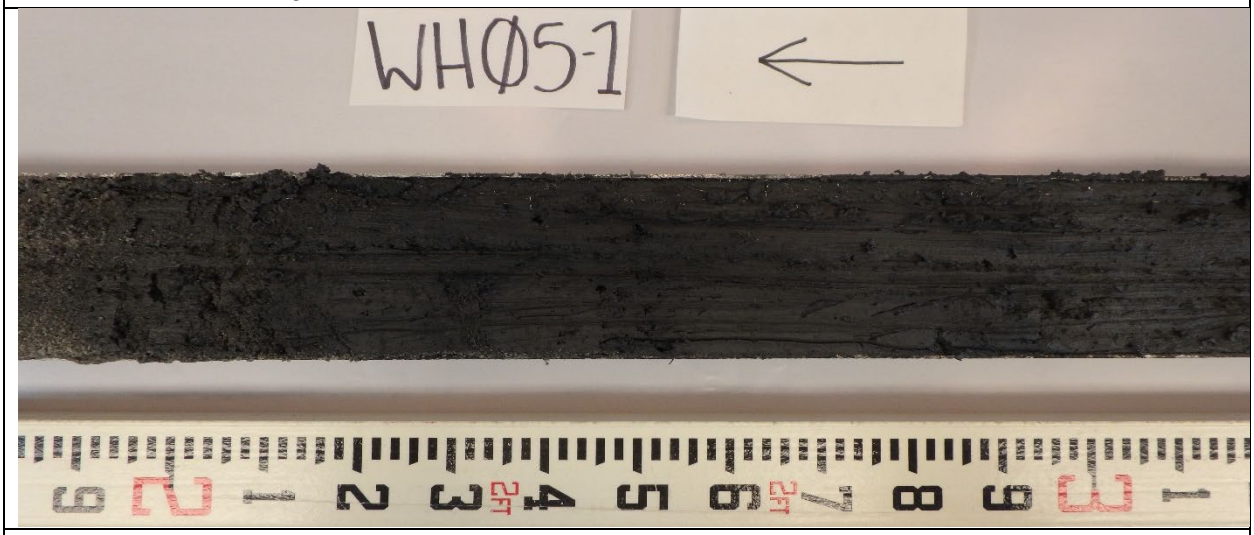
Winter Harbor Core 4 Section 2 4.9-6 ft



Winter Harbor Core 5 Section 1 0-1 ft



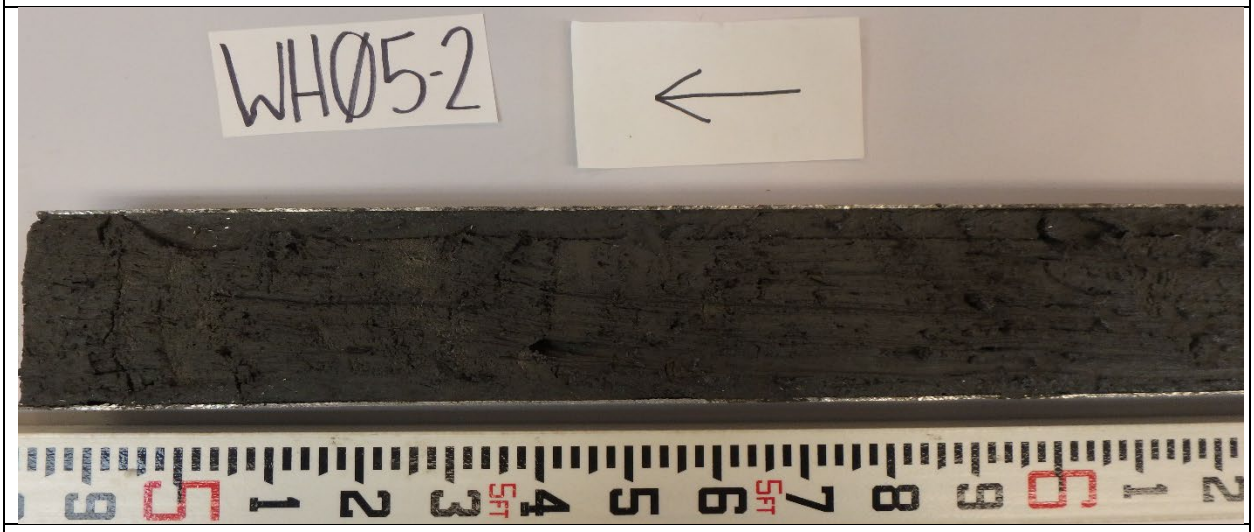
Winter Harbor Core 5 Section 1 1-2 ft



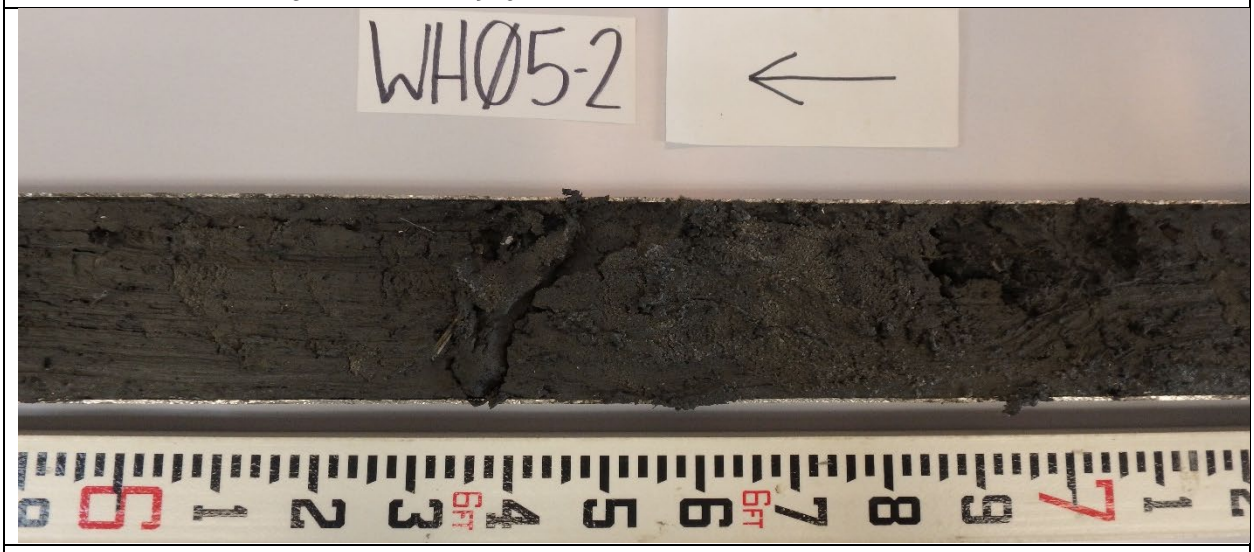
Winter Harbor Core 5 Section 1 2-3 ft

Winter Harbor Core 5 Section 1 3-4 ft

Winter Harbor Core 5 Section 1 4-4.8 ft



Winter Harbor Core 5 Section 2 4.9-6.2 ft

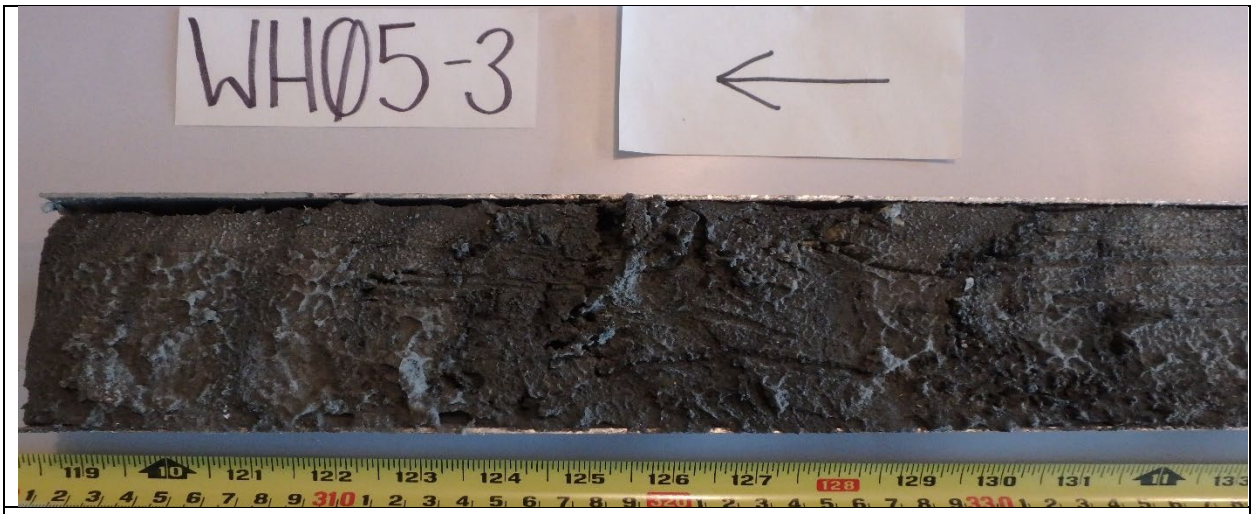


Winter Harbor Core 5 Section 2 6-7 ft

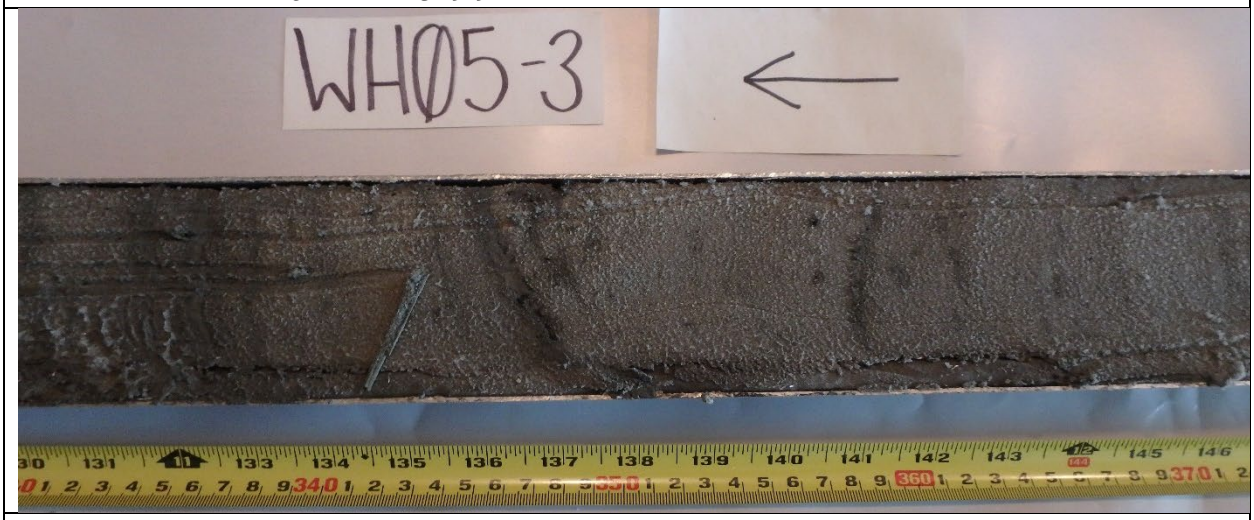
Winter Harbor Core 5 Section 2 7-8 ft

Winter Harbor Core 5 Section 2 8-9 ft

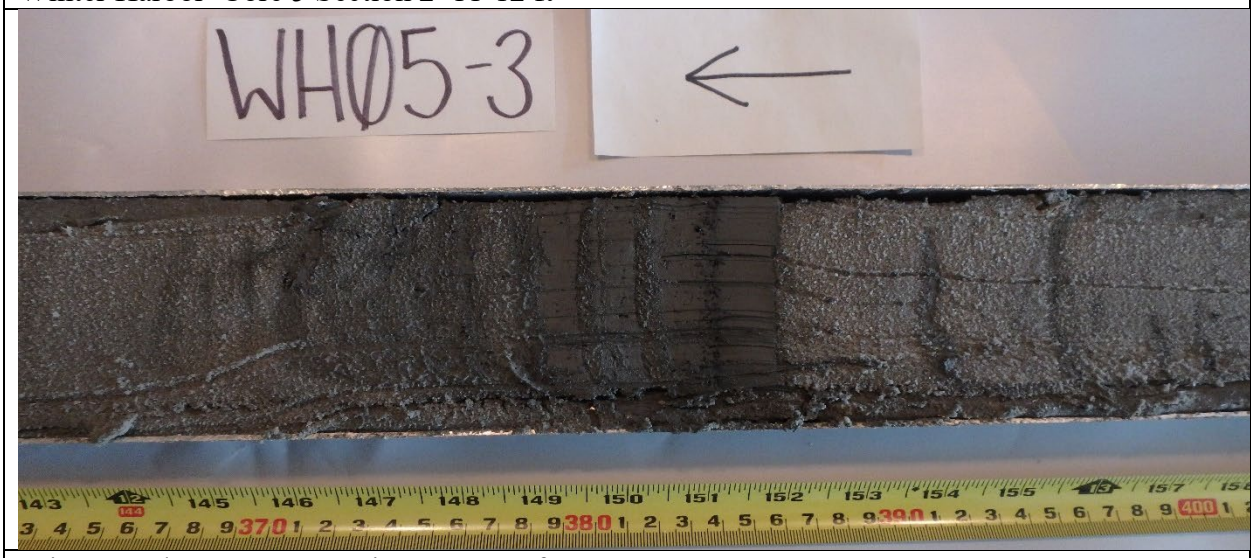
Winter Harbor Core 5 Section 2 8.9-9.9 ft



Winter Harbor Core 5 Section 3 9.9-11 ft



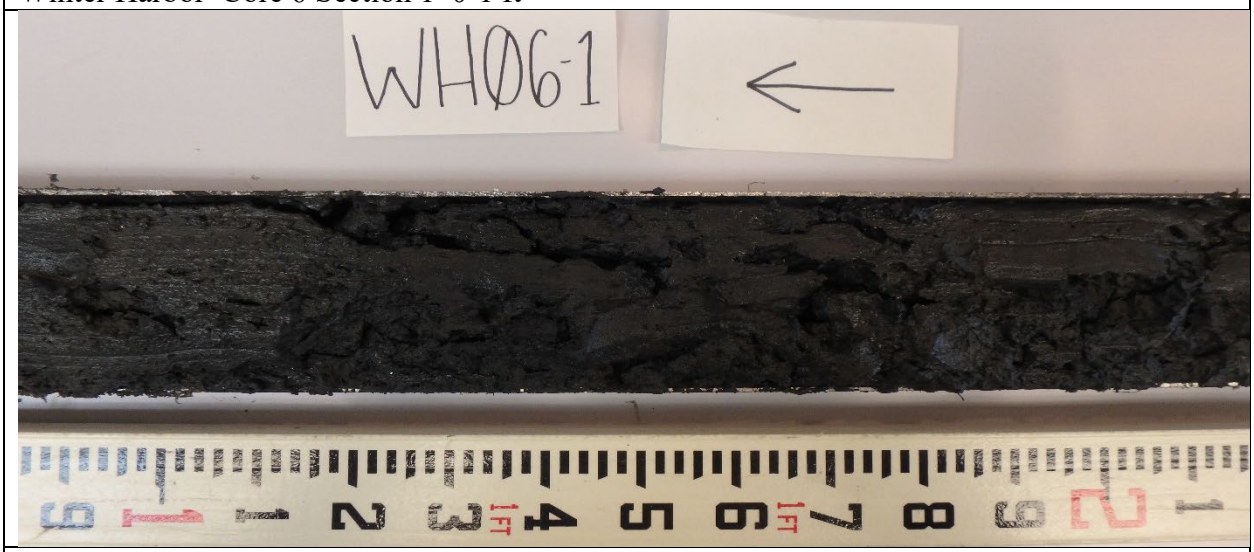
Winter Harbor Core 5 Section 2 11-12 ft



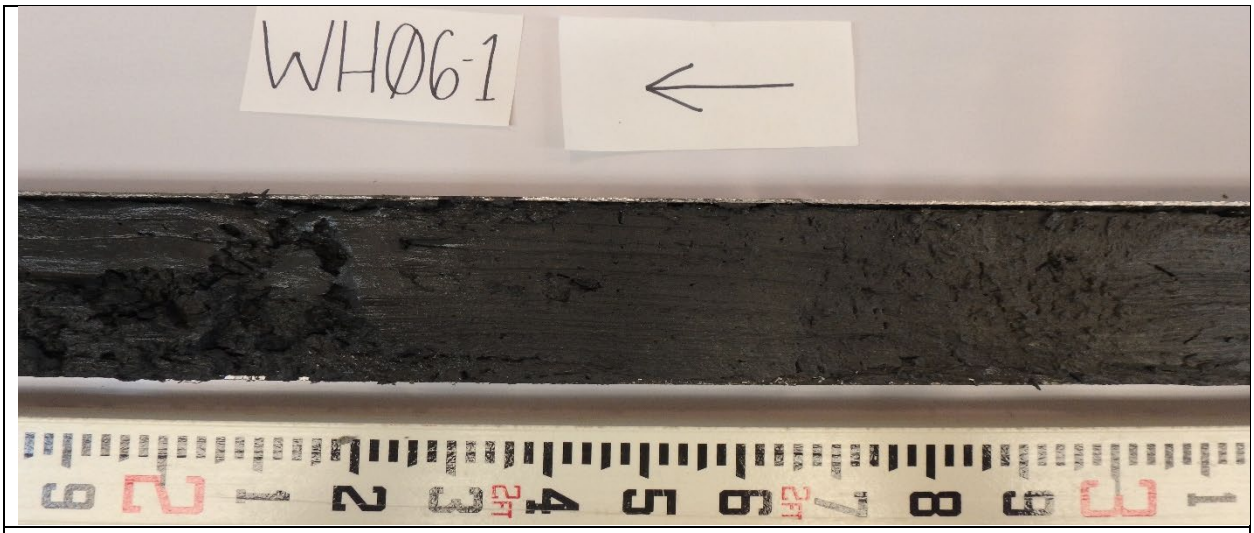
Winter Harbor Core 5 Section 3 12-13 ft

Winter Harbor Core 5 Section 3 13-14.1 ft

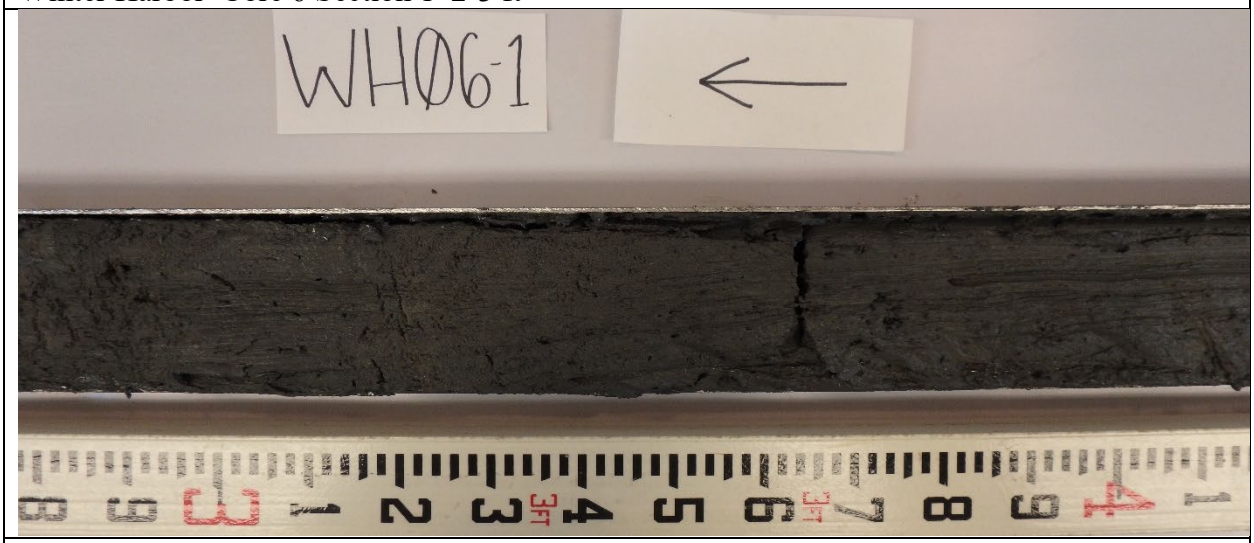
Winter Harbor Core 6 Section 1 0-1 ft



Winter Harbor Core 6 Section 1 1-2 ft



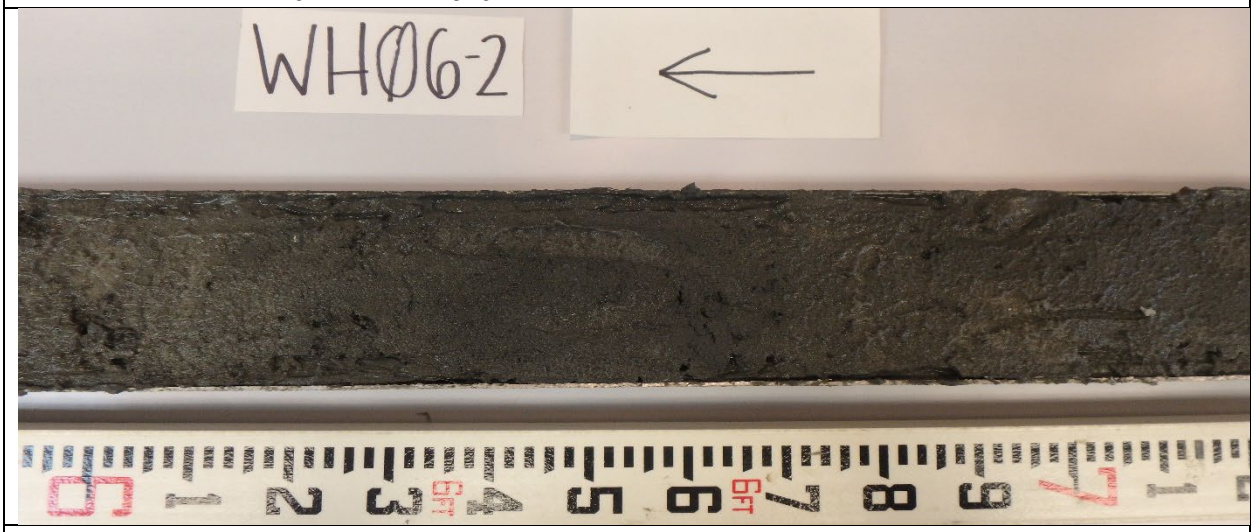
Winter Harbor Core 6 Section 1 2-3 ft



Winter Harbor Core 6 Section 1 3-4 ft

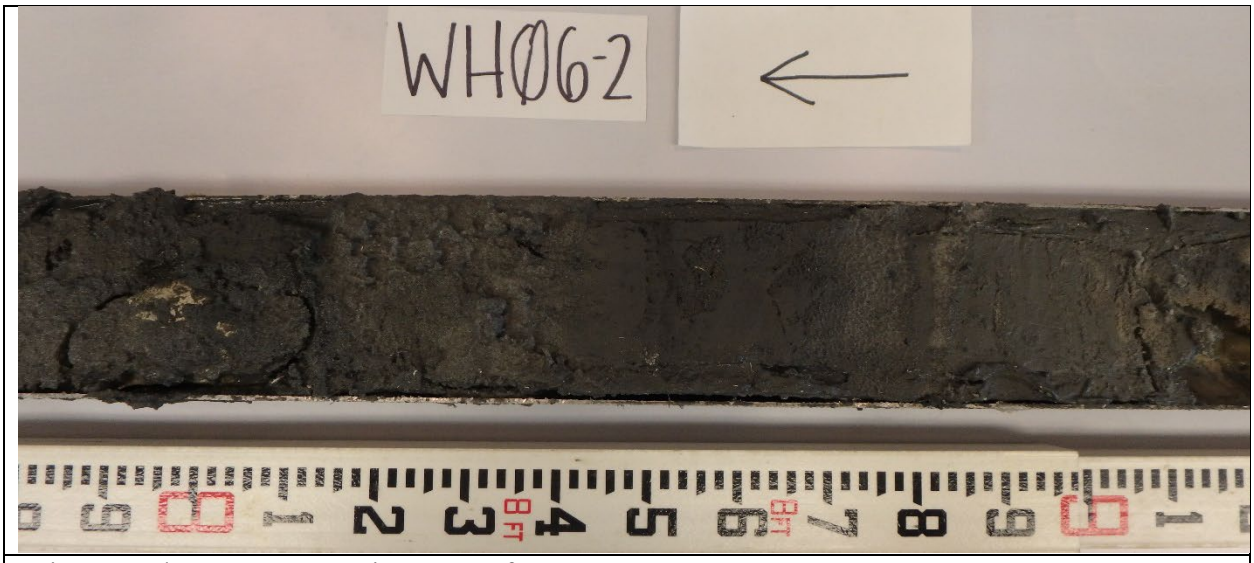
Winter Harbor Core 6 Section 1 4-5 ft

Winter Harbor Core 6 Section 2 5-6 ft



Winter Harbor Core 6 Section 2 6-7 ft

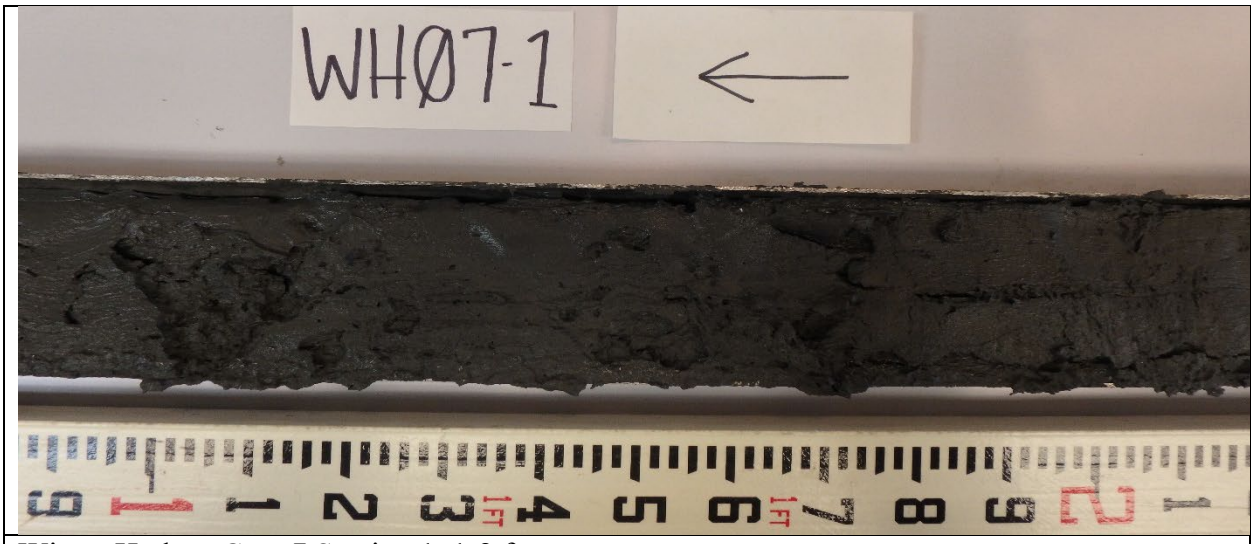
Winter Harbor Core 6 Section 2 7-8 ft



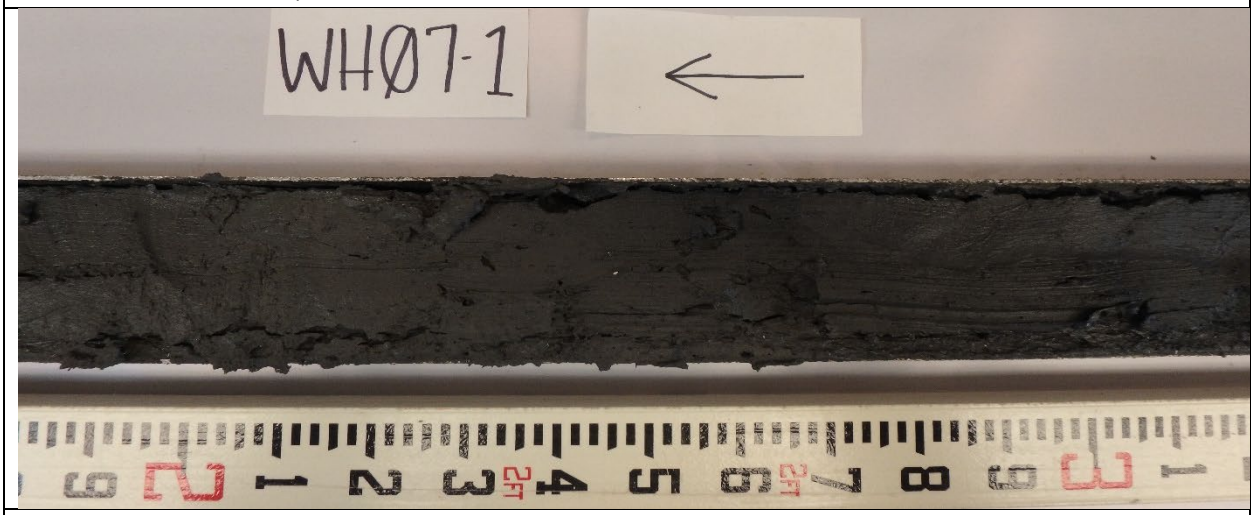
Winter Harbor Core 6 Section 2 8-9 ft

Winter Harbor Core 6 Section 2 9-9.9 ft

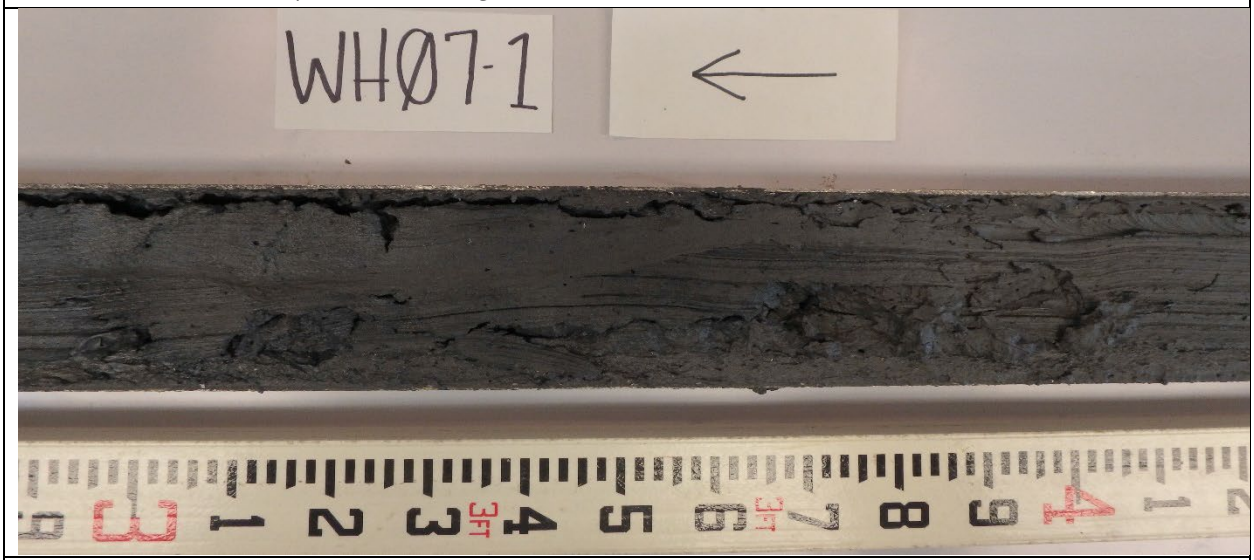
Winter Harbor Core 7 Section 1 0-1 ft



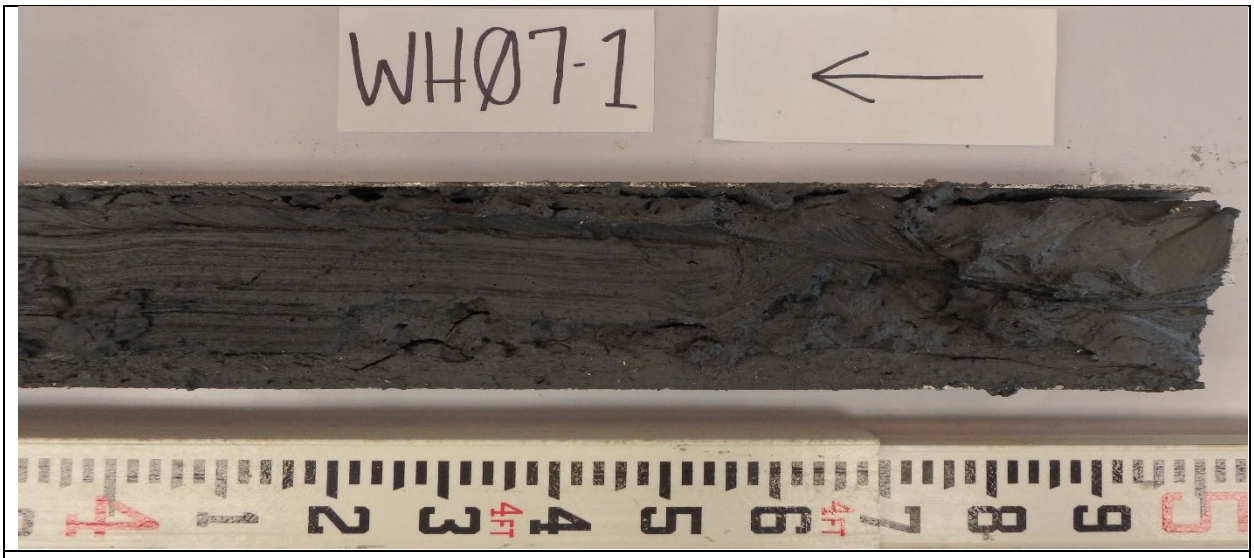
Winter Harbor Core 7 Section 1 1-2 ft



Winter Harbor Core 7 Section 1 2-3 ft



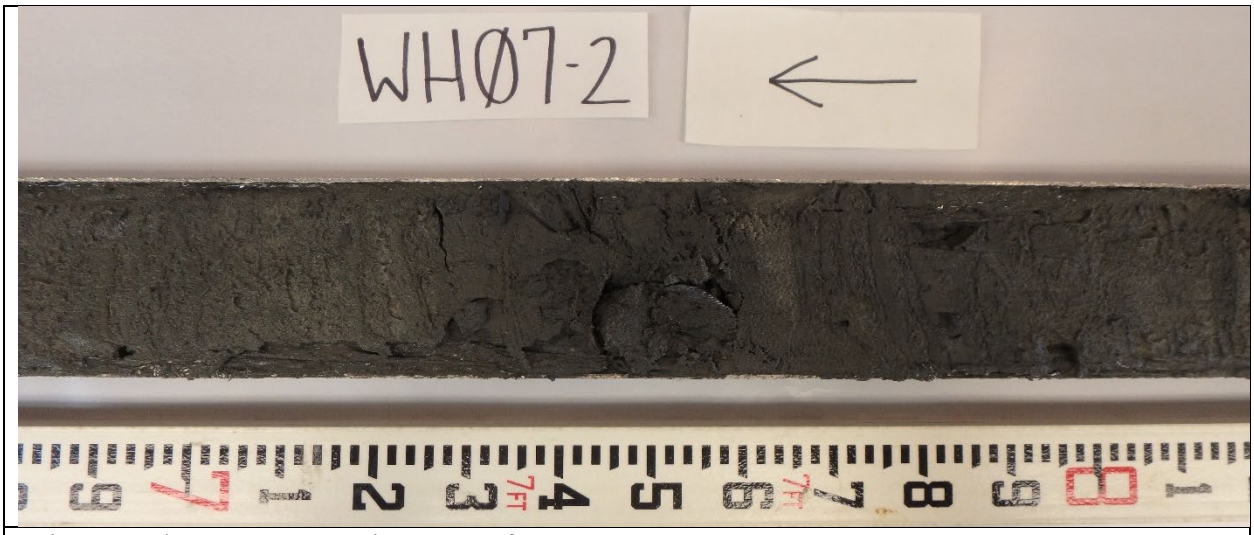
Winter Harbor Core 7 Section 1 3-4 ft



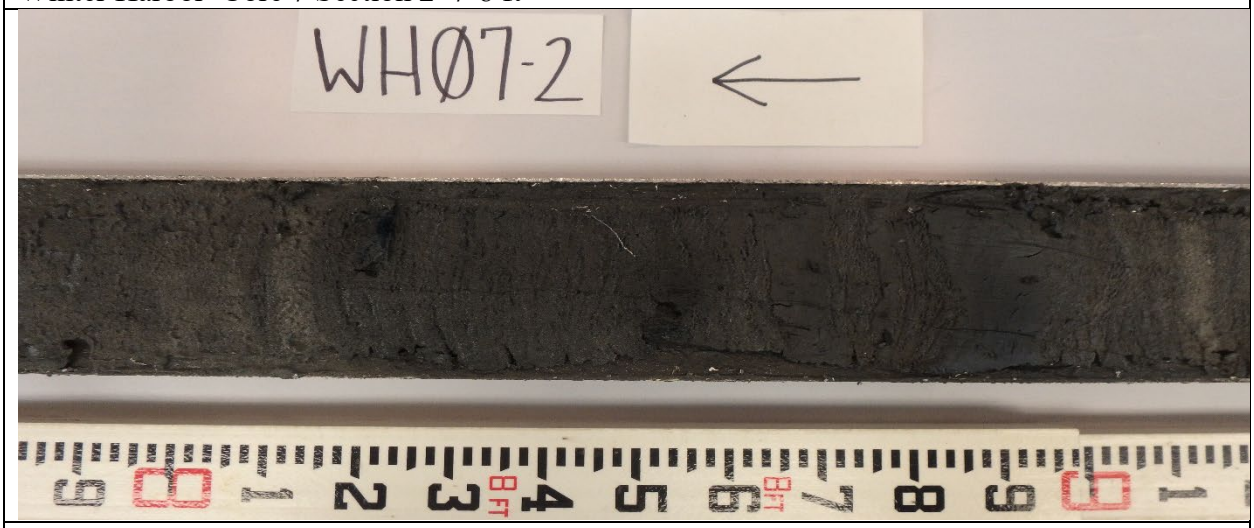
Winter Harbor Core 7 Section 1 4-5 ft

Winter Harbor Core 7 Section 2 5-6 ft

Winter Harbor Core 7 Section 2 6-7 ft



Winter Harbor Core 7 Section 2 7-8 ft



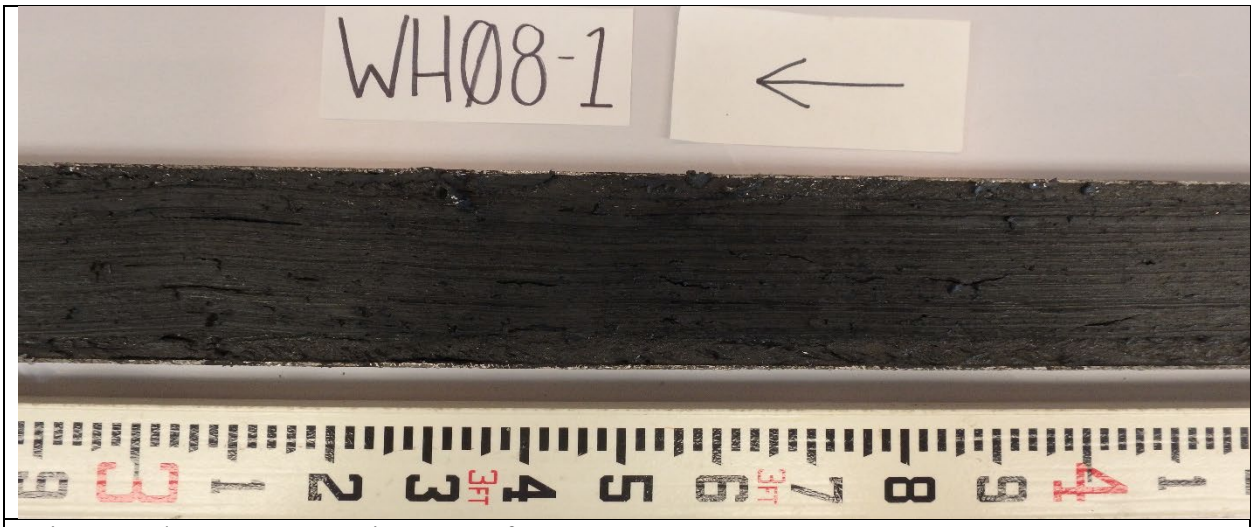
Winter Harbor Core 7 Section 2 8-9 ft

Winter Harbor Core 7 Section 2 9-10 ft

Winter Harbor Core 8 Section 1 0-1 ft

Winter Harbor Core 8 Section 1 1-2 ft

Winter Harbor Core 8 Section 1 2-3 ft

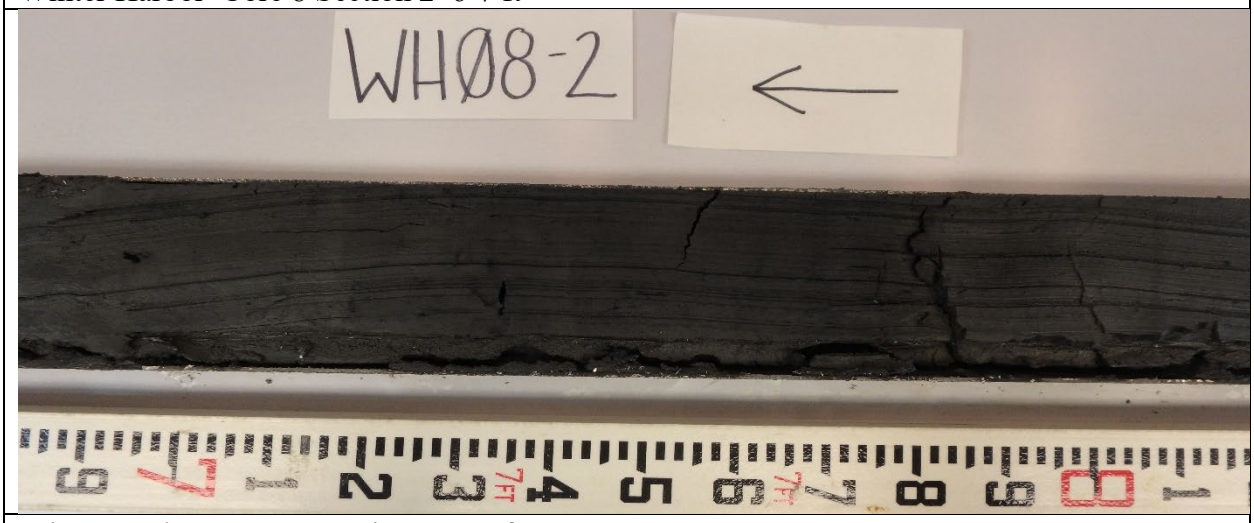


Winter Harbor Core 8 Section 1 3-4 ft

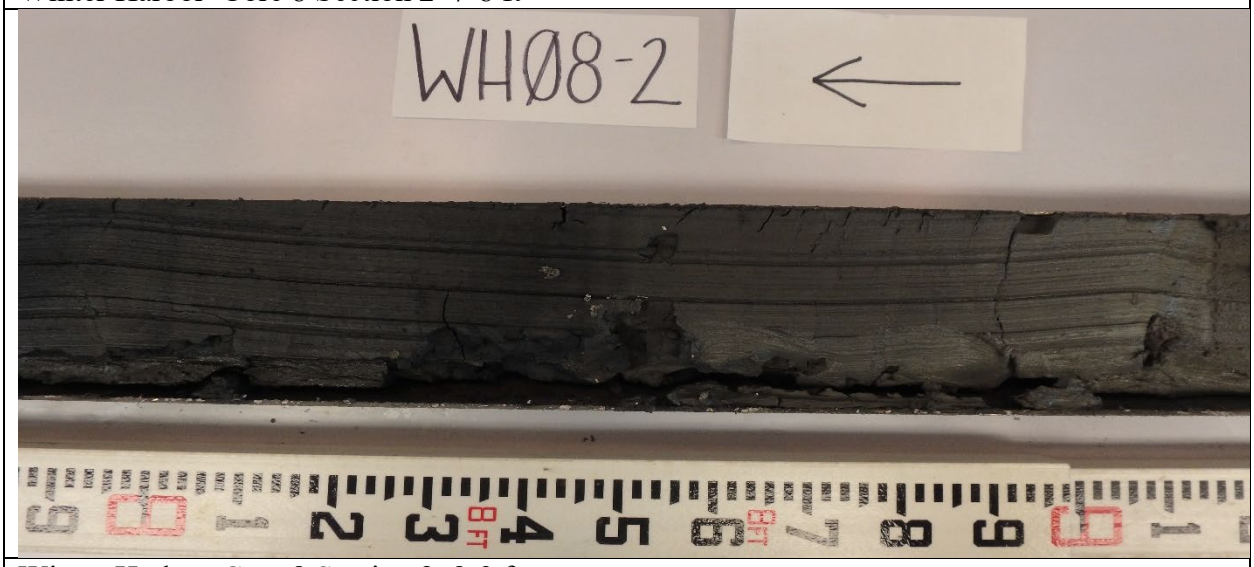
Winter Harbor Core 8 Section 1 4-5 ft

Winter Harbor Core 8 Section 2 5-6 ft

Winter Harbor Core 8 Section 2 6-7 ft



Winter Harbor Core 8 Section 2 7-8 ft



Winter Harbor Core 8 Section 2 8-9 ft

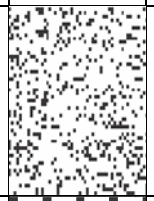
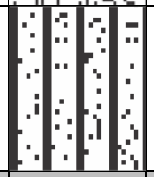
Winter Harbor Core 8 Section 2 9-10 ft

Winter Harbor Core 8 Section 2 10-11 ft

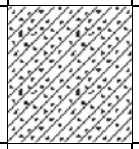
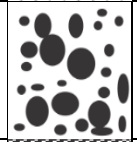
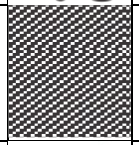
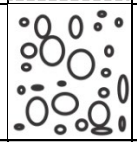
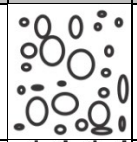
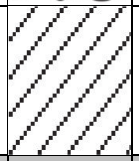
Appendix B

Core Logs

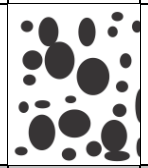
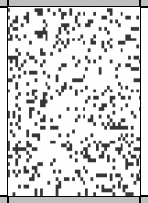
Winter Harbor Core 1 Latitude: 37.3667 Longitude: -76.2479 Date: 10/06/2020

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	0-2	-4.3 to -6.3		**SW**	Fine to medium sand with little silt, well sorted, subrounded, heavy minerals, micaceous, with little organics and trace shells.	Mottled light and olive gray	0/97.4/0.2/2.4 2.6/0.2 14.4
1	2-4.7	-6.3 to -9		**SM**	Bands/laminations (5-170 mm) of alternating sandy silt and fine to medium sand, silt is medium stiff, micaceous, sand is subrounded, heavy minerals, with trace shells.	Dark gray silt bands and light gray sand	0/74.2/17.2/8.6 25.8/0.1 23.1
1	4.7				**End of Section 1**		
Core	4.7				**End of Core**		

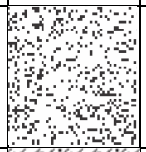
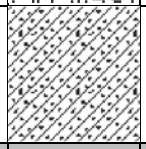
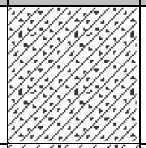
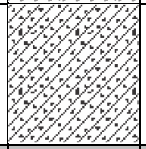
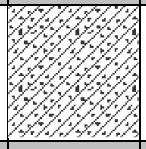
Winter Harbor Core 3 Latitude: 37.3701 Longitude: -76.2541 Date: 10/06/2020

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	0-0.3	-3 to -3.3		**SC**	Clayey and fine to medium sand, clay is medium stiff, sand is subangular, micaceous, heavy minerals, with trace shell fragments.	Dark gray	0/60.3/30.4/9.3 39.7/0.1 25.4
1	0.3-2.2	-3.3 to -5.2		**GW**	Coarse sand and granules and pebbles (≤ 15 mm), subangular, poorly sorted, micaceous, heavy minerals.	Olive gray	18.1/79.1/2.0/0.8 2.8/0.7 7.9
1	2.2-4.7	-5.2 to -7.7		**CH**	Clay, stiff (high plasticity), micaceous, with some organic fragments.	Dark gray	0/12.9/53.6/33.5 87.1/0 44.1
1	4.7-5	-7.7 to -8		**GC**	Fine to coarse sand and granules and pebbles (≤ 10 mm), subrounded, micaceous, poorly sorted, heavy minerals.	Light gray	3.6/90.7/3.4/2.3 5.7/0.5 13.5
1	5				**End of Section 1**		
2	5-5.5	-8 to -8.5		**GC**	Fine to coarse sand and granules and pebbles (≤ 10 mm) with little clay, subrounded, micaceous, poorly sorted, heavy minerals.	Light gray	8.6/84.8/4.5/2.1 6.6/0.6 11.6
2	5.5-9.5	-8.5 to -12.5		**CL**	Clay with some fine to medium sand and trace granules in intermittent ≤ 20 mm bands, clay is medium stiff, with some shells and organic clumps and fragments, micaceous, sand is subrounded, heavy minerals.	Dark gray	2.7/38.6/33.2/25.5 58.7/0 27.2
2	9.5				**End of Section 2**		
Core	9.5				**End of Core**		

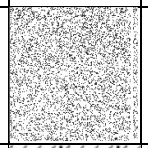
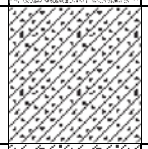
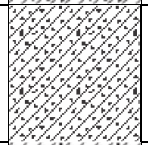
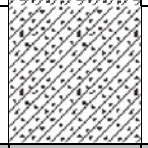
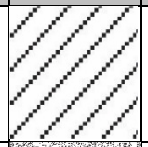
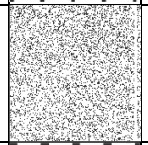
Winter Harbor Core 4 Latitude: 37.3714 Longitude: -76.2572 Date: 10/06/2020

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	0-4.9	1.1 to -3.8		**GW**	Fine to coarse sand and granules and pebbles (≤ 12 mm), poorly sorted, micaceous, subangular to subrounded, heavy minerals, with trace shell and organic fragments, clump of peat at 4.12-4.26 ft.	Light gray	6.4/92.3/0.7/0.6 1.3/0.4 7.0
1	4.9				**End of Section 1**		
2	4.9-6	-3.8 to -4.9		**SW**	Fine to coarse sand with some granules and pebbles (≤ 8 mm) and with little clay, poorly sorted, micaceous, heavy minerals, subrounded, clay present in one 30 mm band at 5.84 ft, clay is stiff (high plasticity), grain size decreases with depth, with trace shell and organic fragments.	Light gray to olive gray	3.8/94.6/0.6/1.0 1.6/0.5 9.1
2	6				**End of Section 2**		
Core	6				**End of Core**		

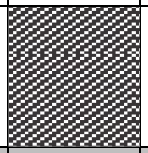
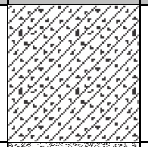
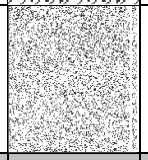
Winter Harbor Core 5 Latitude: 37.3729 Longitude: -76.2578 Date: 10/06/2020

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	0-1.9	1.0 to -2.9		**SW**	Fine to medium sand with little granules and trace clay, poorly sorted, angular, heavy minerals, micaceous, with trace organic fragments.	Light gray	0/96.5/1.3/2.2 3.5/0.4 26.5
1	1.9-4.8	-2.9 to -5.8		**SC**	Clayey sand in top 9 cm, clay is medium stiff (medium to high plasticity), micaceous, with some organic fragments, starting at 3.86 ft bands of fine sand (≤ 3 cm) are present, sand is subangular, heavy minerals.	Dark gray	0/56.0/25.4/18.6 44.0/0.2 35.1
1	4.8				**End of Section 1**		
2	4.8-6.6	-5.8 to -7.6		**SC**	Clayey fine to medium sand in (≤ 3 cm) bands, clay is medium stiff (medium to high plasticity), micaceous, with some organic fragments, sand is subangular, heavy minerals.	Olive gray	0/60.1/25.2/14.7 39.9/0.1 30.4
2	6.6-9.8	-7.6 to -10.8		**SC**	Fine to medium sand with some clay, clay in (≤ 2 cm) bands, subangular, micaceous, heavy minerals.	Light and olive gray	0/88.6/4.5/6.9 11.4/0.2 19.7
2	9.8				**End of Section 2**		
3	9.8-13.9	-10.8 to -14.9		**SC**	Fine sand with some clay in bands (≤ 4 cm), subangular, micaceous, heavy minerals, with little organic fragments, and trace shell fragments.	Light and olive gray	0/90.4/5.2/4.4 9.6/0.2 17.9
3	13.9				**End of Section 2**		
Core	13.9				**End of Core**		

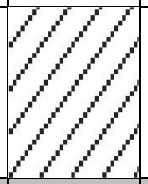
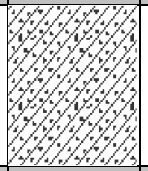
Winter Harbor Core 2 Latitude: 37.3692 Longitude: -76.2515 Date: 10/06/2020

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	0-0.8	-3.9 to -4.7		**SP**	Fine to medium sand, well sorted, subrounded, micaceous, heavy minerals, with trace shell and organic fragments	Olive gray	0/96.4/1.9/1.7 3.6/0.2 19.4
1	0.8-3.4	-4.7 to -7.3		**SC**	Laminated/banded (1-5 mm) clayey and fine to medium sand transitioning to clay in bottom 0.36 ft, clay is soft to medium stiff, sand is micaceous, heavy minerals, subrounded.	Olive gray	0/65.5/23.8/10.7 34.5/0.1 30.3
1	3.4-4.6	-7.3 to -8.5		**SC**	Fine to medium sand with little clay, well sorted, subrounded, micaceous, heavy minerals.	Olive gray	0/92.1/4.6/3.3 7.9/0.2 19.9
1	4.6-4.8	-8.5 to -8.7		**SC**	Clayey with little fine sand, clay is medium stiff, micaceous, with trace shell fragments.	Dark gray	0/68.7/19.6/11.7 31.3/0.1 29.1
1	4.8				**End of Section 1**		
2	4.8-5.8	-8.7 to -9.7		**CL**	Clay with little fine sand, clay is medium stiff, micaceous, intermittent 1-2 mm laminations of fine sand, subrounded, heavy minerals, with trace shell and organic fragments.	Dark gray	0/48.6/30.4/21.0 51.4/0 33.7
2	5.8-6.7	-9.7 to -10.6		**SP**	Fine to medium sand, subangular, micaceous, heavy minerals.	Light gray	0.2/98.2/0.5/1.1 1.6/0.2 14.7
2	6.7-9.8	-10.6 to -13.7		**SM**	Fine to medium sand with some silt, bands of silt in ≤ 10 mm bands, very soft (low plasticity), sand is micaceous, heavy minerals, subrounded, bands stop at 7.9 ft.	Olive gray	0/88.8/4.1/7.1 11.2/0.2 17.4
2	9.8				**End of Section 2/End of Core**		

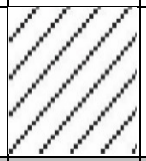
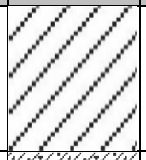
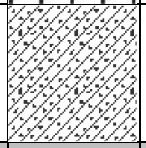
Winter Harbor Core 6 Latitude: 37.3752 Longitude: -76.2567 Date: 10/06/2020

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	-5.3 to -10.3		**CH**	Clay with little fine sand, clay is medium plasticity, micaceous, with trace shell fragments and little organic fragments.	Dark gray	0/18.8/46.5/34.7 81.2/0 43.4
1	5				**End of Section 1**		
2	5-9.2	-10.3 to -14.5		**SC**	Fine to medium sand with some clay in bands (3-50 mm), clay is medium stiff, sand is micaceous, subrounded, heavy minerals, with trace organic and shell fragments.	Dark gray to light gray	0.2/84.2/8.4/7.2 15.6/0.2 20.4
2	9.2-9.9	-14.5 to -15.2		**SP**	Fine to medium sand, well sorted, subangular, micaceous, heavy minerals.	Light gray and slightly yellowish orange	0/98.1/0.3/1.6 1.9/0.2 17.1
2	9.9				**End of Section 2**		
Core	9.9				**End of Core**		

Winter Harbor Core 7 Latitude: 37.3768 Longitude: -76.2579 Date: 10/06/2020

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	-4.5 to -9.5		**CL**	Clay with trace fine to medium sand, clay is medium stiff and stiffens down core, sand present in intermittent bands (1-10 mm), well sorted, subrounded, micaceous, heavy minerals, with trace shell and organic fragments.	Dark gray	0/26.3/45.8/27.9 73.7/0 46.7
1	5				**End of Section 1**		
2	5-9.9	-9.5 to -14.4		**SC**	Clay and fine to medium sand, clay is medium stiff to stiff, micaceous, sand is well sorted, heavy minerals, subrounded, with trace organic fragments, clay and sand are banded alternatingly.	Dark gray to light gray	0/72.6/15.8/11.6 27.4/0.2 25.1
2	9.9				**End of Section 2**		
Core	9.9				**End of Core**		

Winter Harbor Core 8 Latitude: 37.3773 Longitude: -76.2625 Date: 10/06/2020

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	-3.0 to -8.0		**CL**	Clay with little fine sand, clay is soft to medium stiff, micaceous, with trace shell and organic fragments.	Dark gray	0/8.1/52.8/39.1 91.9/0 48.9
1	5						
2	5-9.1	-8.0 to -12.1		**CL**	Clay with little fine sand, clay is medium stiff, micaceous, with trace shell and organic fragments.	Dark gray	0/4.5/48.1/47.4 95.5/0 46.5
2	9.1-11	-12.1 to -14.0		**SC**	Fine to medium sand with some clay, clay is stiff (medium to high plasticity) and in bands (1-80 mm), micaceous, sand is subrounded, well sorted, heavy minerals.	Light gray with dark gray clay bands	0/90.0/5.3/4.7 10.0/0.2 18.2
2	11						
Core	11						

Appendix C

Sediment Data

Name	Location	SampleID	Core	Section	% Moisture Units: % MDL: 0.1
WH01	Winter Harbor	1-1 (0-2 ft)	1	1	14.4
WH02	Winter Harbor	1-1 (2-4.66 ft)	1	1	23.1
WH03	Winter Harbor	2-1 (0-0.84 ft)	2	1	19.4
WH04	Winter Harbor	2-1 (0.84-3.36 ft)	2	1	30.3
WH05	Winter Harbor	2-1 (3.36-4.58 ft)	2	1	19.9
WH06	Winter Harbor	2-1 (4.58-4.8 ft)	2	1	29.1
WH07	Winter Harbor	2-2 (4.8-5.78 ft)	2	2	33.7
WH08	Winter Harbor	2-2 (5.78-6.66 ft)	2	2	14.7
WH09	Winter Harbor	2-2 (6.66-9.8 ft)	2	2	17.4
WH10	Winter Harbor	2-3 (9.8-11.42 ft)	2	3	19.6
WH11	Winter Harbor	3-1 (0-0.32 ft)	3	1	25.4
WH12	Winter Harbor	3-1 (0.32-2.18 ft)	3	1	7.9
WH13	Winter Harbor	3-1 (2.18-4.66 ft)	3	1	44.1
WH14	Winter Harbor	3-1 (4.66-5 ft)	3	1	13.5
WH15	Winter Harbor	3-2 (5-5.46 ft)	3	2	11.6
WH16	Winter Harbor	3-2 (5.46-9.46 ft)	3	2	27.2
WH17	Winter Harbor	4-1 (0-4.88 ft)	4	1	7.0
WH18	Winter Harbor	4-2 (4.88-6.04 ft)	4	2	9.1
WH19	Winter Harbor	5-1 (0-1.88 ft)	5	1	26.5
WH20	Winter Harbor	5-1 (1.88-4.84 ft)	5	1	35.1
WH21	Winter Harbor	5-2 (4.84-6.58 ft)	5	2	30.4
WH22	Winter Harbor	5-2 (6.58-9.84 ft)	5	2	19.7
WH23	Winter Harbor	5-3 (9.84-13.94 ft)	5	3	17.9
WH24	Winter Harbor	6-1 (0-5 ft)	6	1	43.4
WH25	Winter Harbor	6-2 (5-9.16 ft)	6	2	20.4
WH26	Winter Harbor	6-2 (9.16-9.9 ft)	6	2	17.1
WH27	Winter Harbor	7-1 (0-5 ft)	7	1	46.7
WH28	Winter Harbor	7-2 (5-9.94 ft)	7	2	25.1
WH29	Winter Harbor	8-1 (0-4.96 ft)	8	1	48.9
WH30	Winter Harbor	8-2 (4.96-9.12 ft)	8	2	46.5
WH31	Winter Harbor	8-2 (9.12-10.96 ft)	8	2	18.2

Name	SampleID	% Gravel Units: % MDL: 0.1	% Sand Units: % MDL: 0.1	% Silt Units: % MDL: 0.1	% Clay Units: % MDL: 0.1	% Fines Units: %
WH01	1-1 (0-2 ft)	0.0	97.4	0.2	2.4	2.6
WH02	1-1 (2-4.66 ft)	0.0	74.2	17.2	8.6	25.8
WH03	2-1 (0-0.84 ft)	0.0	96.4	1.9	1.7	3.6
WH04	2-1 (0.84-3.36 ft)	0.0	65.5	23.8	10.7	34.5
WH05	2-1 (3.36-4.58 ft)	0.0	92.1	4.6	3.3	7.9
WH06	2-1 (4.58-4.8 ft)	0.0	68.7	19.6	11.7	31.3
WH07	2-2 (4.8-5.78 ft)	0.0	48.6	30.4	21	51.4
WH08	2-2 (5.78-6.66 ft)	0.2	98.2	0.5	1.1	1.6
WH09	2-2 (6.66-9.8 ft)	0.0	88.8	4.1	7.1	11.2
WH10	2-3 (9.8-11.42 ft)	0.2	84.2	6.7	8.9	15.6
WH11	3-1 (0-0.32 ft)	0.0	60.3	30.4	9.3	39.7
WH12	3-1 (0.32-2.18 ft)	18.1	79.1	2	0.8	2.8
WH13	3-1 (2.18-4.66 ft)	0.0	12.9	53.6	33.5	87.1
WH14	3-1 (4.66-5 ft)	3.6	90.7	3.4	2.3	5.7
WH15	3-2 (5-5.46 ft)	8.6	84.8	4.5	2.1	6.6
WH16	3-2 (5.46-9.46 ft)	2.7	38.6	33.2	25.5	58.7
WH17	4-1 (0-4.88 ft)	6.4	92.3	0.7	0.6	1.3
WH18	4-2 (4.88-6.04 ft)	3.8	94.6	0.6	1	1.6
WH19	5-1 (0-1.88 ft)	0.0	96.5	1.3	2.2	3.5
WH20	5-1 (1.88-4.84 ft)	0.0	56.0	25.4	18.6	44
WH21	5-2 (4.84-6.58 ft)	0.0	60.1	25.2	14.7	39.9
WH22	5-2 (6.58-9.84 ft)	0.0	88.6	4.5	6.9	11.4
WH23	5-3 (9.84-13.94 ft)	0.0	90.4	5.2	4.4	9.6
WH24	6-1 (0-5 ft)	0.0	18.8	46.5	34.7	81.2
WH25	6-2 (5-9.16 ft)	0.2	84.2	8.4	7.2	15.6
WH26	6-2 (9.16-9.9 ft)	0.0	98.1	0.3	1.6	1.9
WH27	7-1 (0-5 ft)	0.0	26.3	45.8	27.9	73.7
WH28	7-2 (5-9.94 ft)	0.0	72.6	15.8	11.6	27.4
WH29	8-1 (0-4.96 ft)	0.0	8.1	52.8	39.1	91.9
WH30	8-2 (4.96-9.12 ft)	0.0	4.5	48.1	47.4	95.5
WH31	8-2 (9.12-10.96 ft)	0.0	90.0	5.3	4.7	10

Name	SampleID	Total Sample Mean (mm)	Total Sample Median (mm)	Total Sample Stnd Dev (mm)	Total Sample Skewness (mm)	Total Sample Kurtosis (mm)
WH01	1-1 (0-2 ft)	0.22	0.22	0.07	-0.10	4.14
WH02	1-1 (2-4.66 ft)	0.14	0.14	0.12	6.04	72.78
WH03	2-1 (0-0.84 ft)	0.19	0.18	0.10	7.47	89.45
WH04	2-1 (0.84-3.36 ft)	0.13	0.12	0.19	5.81	44.05
WH05	2-1 (3.36-4.58 ft)	0.18	0.20	0.09	3.92	81.02
WH06	2-1 (4.58-4.8 ft)	0.10	0.12	0.08	9.06	177.55
WH07	2-2 (4.8-5.78 ft)	0.08	0.03	0.10	9.04	140.77
WH08	2-2 (5.78-6.66 ft)	0.20	0.18	0.22	17.30	341.65
WH09	2-2 (6.66-9.8 ft)	0.17	0.18	0.11	5.11	56.20
WH10	2-3 (9.8-11.42 ft)	0.13	0.12	0.22	18.35	382.58
WH11	3-1 (0-0.32 ft)	0.13	0.11	0.11	1.35	4.67
WH12	3-1 (0.32-2.18 ft)	1.37	0.68	1.62	1.52	3.52
WH13	3-1 (2.18-4.66 ft)	0.04	0.03	0.07	14.08	287.94
WH14	3-1 (4.66-5 ft)	0.67	0.52	0.83	4.23	21.14
WH15	3-2 (5-5.46 ft)	0.94	0.62	1.20	2.68	8.75
WH16	3-2 (5.46-9.46 ft)	0.24	0.03	0.77	5.41	31.67
WH17	4-1 (0-4.88 ft)	0.76	0.44	1.08	3.19	12.00
WH18	4-2 (4.88-6.04 ft)	0.67	0.48	0.85	4.19	20.34
WH19	5-1 (0-1.88 ft)	0.40	0.40	0.14	0.18	5.97
WH20	5-1 (1.88-4.84 ft)	0.37	0.18	0.45	1.42	4.41
WH21	5-2 (4.84-6.58 ft)	0.14	0.13	0.15	2.48	15.66
WH22	5-2 (6.58-9.84 ft)	0.16	0.18	0.09	9.63	209.37
WH23	5-3 (9.84-13.94 ft)	0.18	0.18	0.07	4.63	134.51
WH24	6-1 (0-5 ft)	0.04	0.03	0.04	2.06	9.41
WH25	6-2 (5-9.16 ft)	0.19	0.20	0.22	17.74	368.44
WH26	6-2 (9.16-9.9 ft)	0.20	0.20	0.05	-0.28	5.31
WH27	7-1 (0-5 ft)	0.05	0.03	0.07	13.24	343.63
WH28	7-2 (5-9.94 ft)	0.13	0.16	0.08	0.01	4.40
WH29	8-1 (0-4.96 ft)	0.03	0.03	0.02	1.70	7.90
WH30	8-2 (4.96-9.12 ft)	0.02	0.03	0.04	18.24	522.17
WH31	8-2 (9.12-10.96 ft)	0.16	0.17	0.08	3.73	57.20

Appendix D

Chemical Sediment Analysis Results

ENTHALPY ANALYTICAL
formerly Air, Water & Soil Laboratories

1941 Reymet Road ● Richmond, Virginia 23237 ● Tel: (804)-358-8295 Fax: (804)-358-8297

Certificate of Analysis

Final Report

Laboratory Order ID 21B0425

Client Name:	Virginia Institute of Marine Science 1370 Greate Road Gloucester, VA 23062-1346	Date Received:	February 9, 2021 14:11
		Date Issued:	February 16, 2021 17:39
		Project Number:	Shallow Water Dredging
Submitted To:	Donna Milligan	Purchase Order:	PCO2643144
Client Site I.D.:	Shallow Water Dredging		

Enclosed are the results of analyses for samples received by the laboratory on 02/09/2021 14:11. 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.

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:	February 16, 2021 17:39
		Project Number:	Shallow Water Dredging
		Purchase Order:	PCO2643144
Submitted To:	Donna Milligan		
Client Site I.D.:	Shallow Water Dredging		

ANALYTICAL REPORT FOR SAMPLES

Laboratory Order ID 21B0425

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Davis Up Creek	21B0425-01	Solids	02/04/2021 12:42	02/09/2021 14:11
Davis Down Creek	21B0425-02	Solids	02/04/2021 13:07	02/09/2021 14:11
Winter Up Creek	21B0425-03	Solids	02/08/2021 11:10	02/09/2021 14:11
Winter Down Creek	21B0425-04	Solids	02/08/2021 11:30	02/09/2021 14:11
HITW Landward	21B0425-05	Solids	02/04/2021 10:30	02/09/2021 14:11
HITW Bayward	21B0425-06	Solids	02/04/2021 10:50	02/09/2021 14:11

PCB results have been calculated based on dry weight.

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: Project Number: Purchase Order:	February 16, 2021 17:39 Shallow Water Dredging PCO2643144
Submitted To:	Donna Milligan		
Client Site I.D.:	Shallow Water Dredging		

Laboratory Order ID: 21B0425

Analytical Results

Sample I.D. Winter Up Creek **Laboratory Sample ID:** 21B0425-03

Grab Date/Time: 02/08/2021 11:10

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	02/11/21 10:00	02/11/21 16:38	BG
TCLP Arsenic	03	SW6010D	<0.100 mg/L		0.100	1	02/11/21 10:00	02/11/21 16:38	BG
TCLP Barium	03	SW6010D	<5.00 mg/L		5.00	1	02/11/21 10:00	02/11/21 16:38	BG
TCLP Cadmium	03	SW6010D	<0.0400 mg/L		0.0400	1	02/11/21 10:00	02/11/21 16:38	BG
TCLP Chromium	03	SW6010D	<0.100 mg/L		0.100	1	02/11/21 10:00	02/11/21 16:38	BG
TCLP Mercury	03	SW7470A	<0.008 mg/L		0.008	1	02/12/21 08:49	02/12/21 12:59	MWL
TCLP Lead	03	SW6010D	<0.100 mg/L		0.100	1	02/11/21 10:00	02/11/21 16:38	BG
TCLP Selenium	03	SW6010D	<0.250 mg/L		0.250	1	02/11/21 10:00	02/11/21 16:38	BG
TCLP Extraction Fluid, Metals	03	SW1311	**1 #**		--	1	02/10/21 16:00	02/10/21 16:00	ESW
Volatile Organic Compounds by GC									
Methyl-t-butyl ether (MTBE)	03	SW8021B	<5.00 ug/kg		5.00	1	02/11/21 00:00	02/11/21 15:27	MAK
Benzene	03	SW8021B	<5.00 ug/kg		5.00	1	02/11/21 00:00	02/11/21 15:27	MAK
Toluene	03	SW8021B	<5.00 ug/kg		5.00	1	02/11/21 00:00	02/11/21 15:27	MAK
Ethylbenzene	03	SW8021B	<5.00 ug/kg		5.00	1	02/11/21 00:00	02/11/21 15:27	MAK
m+p-Xylenes	03	SW8021B	<10.0 ug/kg		10.0	1	02/11/21 00:00	02/11/21 15:27	MAK
o-Xylene	03	SW8021B	<5.00 ug/kg		5.00	1	02/11/21 00:00	02/11/21 15:27	MAK
Xylenes, Total	03	SW8021B	<15.0 ug/kg		15.0	1	02/11/21 00:00	02/11/21 15:27	MAK
Surr: 2,5-Dibromotoluene (Surr PID)	*03*	*SW8021B*	*94.6 %*		*80-120*		*02/11/21 00:00*	*02/11/21 15:27*	*MAK*
Semivolatile Hydrocarbons by GC									
TPH-Semi-Volatiles (DRO)	03	SW8015C	<10.0 mg/kg		10.0	1	02/11/21 17:00	02/12/21 19:04	LBH2
Surr: Pentacosane (Surr)	*03*	*SW8015C*	*67.3 %*		*45-160*		*02/11/21 17:00*	*02/12/21 19:04*	*LBH2*
TCLP Semivolatile Organic Compounds									

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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:	February 16, 2021 17:39 Shallow Water Dredging PCO2643144
Submitted To:	Donna Milligan		
Client Site I.D.:	Shallow Water Dredging		

Laboratory Order ID: 21B0425

Analytical Results

Sample I.D. Winter Up Creek **Laboratory Sample ID:** 21B0425-03

Grab Date/Time: 02/08/2021 11:10

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	02/10/21 16:00	02/11/21 09:00	SMM
Organochlorine Pesticides and PCBs by GC/ECD									
PCB as Aroclor 1016	03	SW8082A	<0.261 mg/kg dry		0.261	1	02/12/21 10:30	02/15/21 15:17	SKS
PCB as Aroclor 1221	03	SW8082A	<0.261 mg/kg dry		0.261	1	02/12/21 10:30	02/15/21 15:17	SKS
PCB as Aroclor 1232	03	SW8082A	<0.261 mg/kg dry		0.261	1	02/12/21 10:30	02/15/21 15:17	SKS
PCB as Aroclor 1242	03	SW8082A	<0.261 mg/kg dry		0.261	1	02/12/21 10:30	02/15/21 15:17	SKS
PCB as Aroclor 1248	03	SW8082A	<0.261 mg/kg dry		0.261	1	02/12/21 10:30	02/15/21 15:17	SKS
PCB as Aroclor 1254	03	SW8082A	<0.261 mg/kg dry		0.261	1	02/12/21 10:30	02/15/21 15:17	SKS
PCB as Aroclor 1260	03	SW8082A	<0.261 mg/kg dry		0.261	1	02/12/21 10:30	02/15/21 15:17	SKS
Surr: DCB	*03*	*SW8082A*	*50.6 %*		*30-105*		*02/12/21 10:30*	*02/15/21 15:17*	*SKS*
Surr: TCMX	*03*	*SW8082A*	*59.6 %*		*30-105*		*02/12/21 10:30*	*02/15/21 15:17*	*SKS*
TCLP Organochlorine Herbicides by GC/ECD									
TCLP 2,4,5-TP (Silvex)	03	SW8151A	<0.0005 mg/L		0.0005	1	02/11/21 14:55	02/15/21 14:51	SKS
TCLP 2,4-D	03	SW8151A	<0.001 mg/L		0.001	1	02/11/21 14:55	02/15/21 14:51	SKS
Surr: DCAA (Surr)	*03*	*SW8151A*	*79.5 %*		*60-112*		*02/11/21 14:55*	*02/15/21 14:51*	*SKS*
TCLP Organochlorine Pesticides and PCBs by GC/ECD									
TCLP Chlordane	03	SW8081B	<0.030 mg/L		0.030	1	02/12/21 14:00	02/15/21 19:45	SKS
TCLP Endrin	03	SW8081B	<0.005 mg/L		0.005	1	02/12/21 14:00	02/15/21 19:45	SKS
TCLP gamma-BHC (Lindane)	03	SW8081B	<0.005 mg/L		0.005	1	02/12/21 14:00	02/15/21 19:45	SKS
TCLP Heptachlor	03	SW8081B	<0.005 mg/L		0.005	1	02/12/21 14:00	02/15/21 19:45	SKS
TCLP Heptachlor Epoxide	03	SW8081B	<0.005 mg/L		0.005	1	02/12/21 14:00	02/15/21 19:45	SKS
TCLP Methoxychlor	03	SW8081B	<0.005 mg/L		0.005	1	02/12/21 14:00	02/15/21 19:45	SKS
TCLP Toxaphene	03	SW8081B	<0.500 mg/L		0.500	1	02/12/21 14:00	02/15/21 19:45	SKS
Surr: TCMX	*03*	*SW8081B*	*46.5 %*		*18-112*		*02/12/21 14:00*	*02/15/21 19:45*	*SKS*

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Final Report

Client Name:	Virginia Institute of Marine Science 1370 Greate Road Gloucester VA, 23062-1346	Date Issued:	February 16, 2021 17:39
		Project Number:	Shallow Water Dredging
		Purchase Order:	PCO2643144
Submitted To:	Donna Milligan		
Client Site I.D.:	Shallow Water Dredging		

Laboratory Order ID: 21B0425

Analytical Results

Sample I.D. Winter Up Creek **Laboratory Sample ID:** 21B0425-03

Grab Date/Time: 02/08/2021 11:10

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*	*56.7 %*		*27-131*		*02/12/21 14:00*	*02/15/21 19:45*	*SKS*
Wet Chemistry Analysis									
Percent Solids	03	SM22 2540G-2011	**37.9 %**		0.10	1	02/15/21 09:32	02/15/21 09:32	SNL

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Client Name:	Virginia Institute of Marine Science 1370 Greate Road Gloucester VA, 23062-1346	Date Issued: Project Number: Purchase Order:	February 16, 2021 17:39 Shallow Water Dredging PCO2643144
Submitted To:	Donna Milligan		
Client Site I.D.:	Shallow Water Dredging		

Laboratory Order ID: 21B0425

Analytical Results

Sample I.D. Winter Down Creek **Laboratory Sample ID:** 21B0425-04

Grab Date/Time: 02/08/2021 11:30

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	02/11/21 10:00	02/11/21 16:40	BG
TCLP Arsenic	04	SW6010D	<0.100 mg/L		0.100	1	02/11/21 10:00	02/11/21 16:40	BG
TCLP Barium	04	SW6010D	<5.00 mg/L		5.00	1	02/11/21 10:00	02/11/21 16:40	BG
TCLP Cadmium	04	SW6010D	<0.0400 mg/L		0.0400	1	02/11/21 10:00	02/11/21 16:40	BG
TCLP Chromium	04	SW6010D	<0.100 mg/L		0.100	1	02/11/21 10:00	02/11/21 16:40	BG
TCLP Mercury	04	SW7470A	<0.008 mg/L		0.008	1	02/12/21 08:49	02/12/21 13:01	MWL
TCLP Lead	04	SW6010D	<0.100 mg/L		0.100	1	02/11/21 10:00	02/11/21 16:40	BG
TCLP Selenium	04	SW6010D	<0.250 mg/L		0.250	1	02/11/21 10:00	02/11/21 16:40	BG
TCLP Extraction Fluid, Metals	04	SW1311	**1 #**		--	1	02/10/21 16:00	02/10/21 16:00	ESW
Volatile Organic Compounds by GC									
Methyl-t-butyl ether (MTBE)	04	SW8021B	<5.00 ug/kg		5.00	1	02/11/21 00:00	02/11/21 15:50	MAK
Benzene	04	SW8021B	<5.00 ug/kg		5.00	1	02/11/21 00:00	02/11/21 15:50	MAK
Toluene	04	SW8021B	<5.00 ug/kg		5.00	1	02/11/21 00:00	02/11/21 15:50	MAK
Ethylbenzene	04	SW8021B	<5.00 ug/kg		5.00	1	02/11/21 00:00	02/11/21 15:50	MAK
m+p-Xylenes	04	SW8021B	<10.0 ug/kg		10.0	1	02/11/21 00:00	02/11/21 15:50	MAK
o-Xylene	04	SW8021B	<5.00 ug/kg		5.00	1	02/11/21 00:00	02/11/21 15:50	MAK
Xylenes, Total	04	SW8021B	<15.0 ug/kg		15.0	1	02/11/21 00:00	02/11/21 15:50	MAK
Surr: 2,5-Dibromotoluene (Surr PID)	*04*	*SW8021B*	*92.4 %*		*80-120*		*02/11/21 00:00*	*02/11/21 15:50*	*MAK*
Semivolatile Hydrocarbons by GC									
TPH-Semi-Volatiles (DRO)	04	SW8015C	<10.0 mg/kg		10.0	1	02/11/21 17:00	02/12/21 19:30	LBH2
Surr: Pentacosane (Surr)	*04*	*SW8015C*	*68.6 %*		*45-160*		*02/11/21 17:00*	*02/12/21 19:30*	*LBH2*
TCLP Semivolatile Organic Compounds									

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Final Report

Client Name:	Virginia Institute of Marine Science 1370 Greate Road Gloucester VA, 23062-1346	Date Issued:	February 16, 2021 17:39
		Project Number:	Shallow Water Dredging
		Purchase Order:	PCO2643144
Submitted To:	Donna Milligan		
Client Site I.D.:	Shallow Water Dredging		

Laboratory Order ID: 21B0425

Analytical Results

Sample I.D. Winter Down Creek **Laboratory Sample ID:** 21B0425-04

Grab Date/Time: 02/08/2021 11:30

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	02/10/21 16:00	02/11/21 09:00	SMM
Organochlorine Pesticides and PCBs by GC/ECD									
PCB as Aroclor 1016	04	SW8082A	<0.150 mg/kg dry		0.150	1	02/12/21 10:30	02/15/21 15:39	SKS
PCB as Aroclor 1221	04	SW8082A	<0.150 mg/kg dry		0.150	1	02/12/21 10:30	02/15/21 15:39	SKS
PCB as Aroclor 1232	04	SW8082A	<0.150 mg/kg dry		0.150	1	02/12/21 10:30	02/15/21 15:39	SKS
PCB as Aroclor 1242	04	SW8082A	<0.150 mg/kg dry		0.150	1	02/12/21 10:30	02/15/21 15:39	SKS
PCB as Aroclor 1248	04	SW8082A	<0.150 mg/kg dry		0.150	1	02/12/21 10:30	02/15/21 15:39	SKS
PCB as Aroclor 1254	04	SW8082A	<0.150 mg/kg dry		0.150	1	02/12/21 10:30	02/15/21 15:39	SKS
PCB as Aroclor 1260	04	SW8082A	<0.150 mg/kg dry		0.150	1	02/12/21 10:30	02/15/21 15:39	SKS
Surr: DCB	*04*	*SW8082A*	*54.0 %*		*30-105*		*02/12/21 10:30*	*02/15/21 15:39*	*SKS*
Surr: TCMX	*04*	*SW8082A*	*58.7 %*		*30-105*		*02/12/21 10:30*	*02/15/21 15:39*	*SKS*
TCLP Organochlorine Herbicides by GC/ECD									
TCLP 2,4,5-TP (Silvex)	04	SW8151A	<0.0005 mg/L		0.0005	1	02/11/21 14:55	02/15/21 15:16	SKS
TCLP 2,4-D	04	SW8151A	<0.001 mg/L		0.001	1	02/11/21 14:55	02/15/21 15:16	SKS
Surr: DCAA (Surr)	*04*	*SW8151A*	*70.9 %*		*60-112*		*02/11/21 14:55*	*02/15/21 15:16*	*SKS*
TCLP Organochlorine Pesticides and PCBs by GC/ECD									
TCLP Chlordane	04	SW8081B	<0.030 mg/L		0.030	1	02/12/21 14:00	02/15/21 20:04	SKS
TCLP Endrin	04	SW8081B	<0.005 mg/L		0.005	1	02/12/21 14:00	02/15/21 20:04	SKS
TCLP gamma-BHC (Lindane)	04	SW8081B	<0.005 mg/L		0.005	1	02/12/21 14:00	02/15/21 20:04	SKS
TCLP Heptachlor	04	SW8081B	<0.005 mg/L		0.005	1	02/12/21 14:00	02/15/21 20:04	SKS
TCLP Heptachlor Epoxide	04	SW8081B	<0.005 mg/L		0.005	1	02/12/21 14:00	02/15/21 20:04	SKS
TCLP Methoxychlor	04	SW8081B	<0.005 mg/L		0.005	1	02/12/21 14:00	02/15/21 20:04	SKS
TCLP Toxaphene	04	SW8081B	<0.500 mg/L		0.500	1	02/12/21 14:00	02/15/21 20:04	SKS
Surr: TCMX	*04*	*SW8081B*	*59.7 %*		*18-112*		*02/12/21 14:00*	*02/15/21 20:04*	*SKS*

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Final Report

Client Name:	Virginia Institute of Marine Science 1370 Greate Road Gloucester VA, 23062-1346	Date Issued:	February 16, 2021 17:39
		Project Number:	Shallow Water Dredging
		Purchase Order:	PCO2643144
Submitted To:	Donna Milligan		
Client Site I.D.:	Shallow Water Dredging		

Laboratory Order ID: 21B0425

Analytical Results

Sample I.D. Winter Down Creek **Laboratory Sample ID:** 21B0425-04

Grab Date/Time: 02/08/2021 11:30

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*	*59.1 %*		*27-131*		*02/12/21 14:00*	*02/15/21 20:04*	*SKS*
Wet Chemistry Analysis									
Percent Solids	04	SM22 2540G-2011	**66.4 %**		0.10	1	02/15/21 09:32	02/15/21 09:32	SNL

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		Project Number:	Shallow Water Dredging
		Purchase Order:	PCO2643144
Submitted To:	Donna Milligan		
Client Site I.D.:	Shallow Water Dredging		

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**		
21B0425-01	10.0 g / 10.0 mL	SM22 2540G-2011	BEB0457	SEB0430	
21B0425-02	10.0 g / 10.0 mL	SM22 2540G-2011	BEB0457	SEB0430	
21B0425-03	10.0 g / 10.0 mL	SM22 2540G-2011	BEB0457	SEB0430	
21B0425-04	10.0 g / 10.0 mL	SM22 2540G-2011	BEB0457	SEB0430	
21B0425-05	10.0 g / 10.0 mL	SM22 2540G-2011	BEB0457	SEB0430	
21B0425-06	10.0 g / 10.0 mL	SM22 2540G-2011	BEB0457	SEB0430	

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
TCLP Metals by 6000/7000 Series Methods		**Preparation Method:**	**SW1311 Metals**		
21B0425-01	100 g / 2000 mL	SW1311	BEB0355	SEB0333	
21B0425-02	100 g / 2000 mL	SW1311	BEB0355	SEB0333	
21B0425-03	100 g / 2000 mL	SW1311	BEB0355	SEB0333	
21B0425-04	100 g / 2000 mL	SW1311	BEB0355	SEB0333	
21B0425-05	100 g / 2000 mL	SW1311	BEB0355	SEB0333	
21B0425-06	100 g / 2000 mL	SW1311	BEB0355	SEB0333	

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
TCLP Metals by 6000/7000 Series Methods		**Preparation Method:**	**SW3010A**		
21B0425-01	10.0 mL / 50.0 mL	SW6010D	BEB0359	SEB0388	AB10051
21B0425-02	10.0 mL / 50.0 mL	SW6010D	BEB0359	SEB0388	AB10051
21B0425-03	10.0 mL / 50.0 mL	SW6010D	BEB0359	SEB0388	AB10051
21B0425-04	10.0 mL / 50.0 mL	SW6010D	BEB0359	SEB0388	AB10051
21B0425-05	10.0 mL / 50.0 mL	SW6010D	BEB0359	SEB0388	AB10051
21B0425-06	10.0 mL / 50.0 mL	SW6010D	BEB0359	SEB0388	AB10051

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

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		Project Number:	Shallow Water Dredging
		Purchase Order:	PCO2643144
Submitted To:	Donna Milligan		
Client Site I.D.:	Shallow Water Dredging		

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
21B0425-01	100 g / 2000 mL	SW1311	BEB0372	SEB0345	AL00098
21B0425-02	100 g / 2000 mL	SW1311	BEB0372	SEB0345	AL00098
21B0425-03	100 g / 2000 mL	SW1311	BEB0372	SEB0345	AL00098
21B0425-04	100 g / 2000 mL	SW1311	BEB0372	SEB0345	AL00098
21B0425-05	100 g / 2000 mL	SW1311	BEB0372	SEB0345	AL00098
21B0425-06	100 g / 2000 mL	SW1311	BEB0372	SEB0345	AL00098
TCLP Organochlorine Herbicides by GC/ECD		**Preparation Method:**	**SW3510C**		
21B0425-01	100 mL / 5.00 mL	SW8151A	BEB0380	SEB0500	AK00094
21B0425-02	100 mL / 5.00 mL	SW8151A	BEB0380	SEB0500	AK00094
21B0425-03	100 mL / 5.00 mL	SW8151A	BEB0380	SEB0500	AK00094
21B0425-04	100 mL / 5.00 mL	SW8151A	BEB0380	SEB0500	AK00094
21B0425-05	100 mL / 5.00 mL	SW8151A	BEB0380	SEB0500	AK00094
21B0425-06	100 mL / 5.00 mL	SW8151A	BEB0380	SEB0500	AK00094
Semivolatile Hydrocarbons by GC		**Preparation Method:**	**SW3510C**		
21B0425-01	50.6 g / 1.00 mL	SW8015C	BEB0403	SEB0456	AA10005
21B0425-02	50.8 g / 1.00 mL	SW8015C	BEB0403	SEB0456	AA10005
21B0425-03	51.7 g / 1.00 mL	SW8015C	BEB0403	SEB0456	AA10005
21B0425-04	50.2 g / 1.00 mL	SW8015C	BEB0403	SEB0456	AA10005
21B0425-05	52.0 g / 1.00 mL	SW8015C	BEB0403	SEB0456	AA10005
21B0425-06	50.6 g / 1.00 mL	SW8015C	BEB0403	SEB0456	AA10005
TCLP Organochlorine Pesticides and PCBs by GC/ECD		**Preparation Method:**	**SW3510C**		
21B0425-01	100 mL / 1.00 mL	SW8081B	BEB0442	SEB0502	AK00001
21B0425-02	100 mL / 1.00 mL	SW8081B	BEB0442	SEB0502	AK00001
21B0425-03	100 mL / 1.00 mL	SW8081B	BEB0442	SEB0502	AK00001
21B0425-04	100 mL / 1.00 mL	SW8081B	BEB0442	SEB0502	AK00001
21B0425-05	100 mL / 1.00 mL	SW8081B	BEB0442	SEB0502	AK00001
21B0425-06	100 mL / 1.00 mL	SW8081B	BEB0442	SEB0502	AK00001

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Organochlorine Pesticides and PCBs by GC/ECD		**Preparation Method:**	**SW3550B**		
21B0425-01	30.4 g / 5.00 mL	SW8082A	BEB0391	SEB0487	AJ00088
21B0425-02	30.6 g / 5.00 mL	SW8082A	BEB0391	SEB0487	AJ00088
21B0425-03	30.3 g / 5.00 mL	SW8082A	BEB0391	SEB0487	AJ00088
21B0425-04	30.1 g / 5.00 mL	SW8082A	BEB0391	SEB0487	AJ00088

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Final Report

Client Name:	Virginia Institute of Marine Science 1370 Greate Road Gloucester VA, 23062-1346	Date Issued:	February 16, 2021 17:39
		Project Number:	Shallow Water Dredging
		Purchase Order:	PCO2643144
Submitted To:	Donna Milligan		
Client Site I.D.:	Shallow Water Dredging		

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
21B0425-05	30.4 g / 5.00 mL	SW8082A	BEB0391	SEB0487	AJ00088
21B0425-06	30.1 g / 5.00 mL	SW8082A	BEB0391	SEB0487	AJ00088

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Volatile Organic Compounds by GC		**Preparation Method:**	**SW5030B**		
21B0425-01	5.37 g / 5.00 mL	SW8021B	BEB0400	SEB0411	AB10048
21B0425-02	5.19 g / 5.00 mL	SW8021B	BEB0400	SEB0411	AB10048
21B0425-03	5.20 g / 5.00 mL	SW8021B	BEB0400	SEB0411	AB10048
21B0425-04	5.09 g / 5.00 mL	SW8021B	BEB0400	SEB0411	AB10048
21B0425-05	5.14 g / 5.00 mL	SW8021B	BEB0400	SEB0411	AB10048
21B0425-06	5.01 g / 5.00 mL	SW8021B	BEB0400	SEB0411	AB10048

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
TCLP Metals by 6000/7000 Series Methods		**Preparation Method:**	**SW7470A**		
21B0425-01	1.00 mL / 20.0 mL	SW7470A	BEB0413	SEB0402	AB10056
21B0425-02	1.00 mL / 20.0 mL	SW7470A	BEB0413	SEB0402	AB10056
21B0425-03	1.00 mL / 20.0 mL	SW7470A	BEB0413	SEB0402	AB10056
21B0425-04	1.00 mL / 20.0 mL	SW7470A	BEB0413	SEB0402	AB10056
21B0425-05	1.00 mL / 20.0 mL	SW7470A	BEB0413	SEB0402	AB10056
21B0425-06	1.00 mL / 20.0 mL	SW7470A	BEB0413	SEB0402	AB10056

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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 BEB0355 - SW1311 Metals										
Blank (BEB0355-BLK1)				Prepared & Analyzed: 02/10/2021						
Extraction Fluid, Metals	1 #	0	#							
Batch BEB0359 - SW3010A										
Blank (BEB0359-BLK1)				Prepared & Analyzed: 02/11/2021						
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 (BEB0359-BS1)				Prepared & Analyzed: 02/11/2021						
Arsenic	2.51 mg/L	0.100	mg/L	2.50	mg/L	100	80-120			
Barium	<5.00 mg/L	5.00	mg/L	2.50	mg/L	105	80-120			
Cadmium	2.40 mg/L	0.0400	mg/L	2.50	mg/L	96.0	80-120			
Chromium	2.39 mg/L	0.100	mg/L	2.50	mg/L	95.6	80-120			
Lead	2.38 mg/L	0.100	mg/L	2.50	mg/L	95.1	80-120			
Selenium	2.39 mg/L	0.250	mg/L	2.50	mg/L	95.5	80-120			
Silver	0.471 mg/L	0.100	mg/L	0.500	mg/L	94.1	80-120			
LCS Dup (BEB0359-BSD1)				Prepared & Analyzed: 02/11/2021						
Arsenic	2.48 mg/L	0.100	mg/L	2.50	mg/L	99.2	80-120	1.04	20	
Barium	<5.00 mg/L	5.00	mg/L	2.50	mg/L	104	80-120	0.978	20	
Cadmium	2.39 mg/L	0.0400	mg/L	2.50	mg/L	95.5	80-120	0.519	20	
Chromium	2.36 mg/L	0.100	mg/L	2.50	mg/L	94.4	80-120	1.31	20	
Lead	2.38 mg/L	0.100	mg/L	2.50	mg/L	95.2	80-120	0.0673	20	
Selenium	2.38 mg/L	0.250	mg/L	2.50	mg/L	95.0	80-120	0.470	20	
Silver	0.462 mg/L	0.100	mg/L	0.500	mg/L	92.4	80-120	1.88	20	

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		Purchase Order:	PCO2643144
Submitted To:	Donna Milligan		
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 BEB0359 - SW3010A										
Matrix Spike (BEB0359-MS1)	**Source: 21B0425-01**			Prepared & Analyzed: 02/11/2021						
Arsenic	2.57 mg/L	0.100	mg/L	2.50	<0.100 mg/L	103	75-125			
Barium	<5.00 mg/L	5.00	mg/L	2.50	<5.00 mg/L	114	75-125			
Cadmium	2.44 mg/L	0.0400	mg/L	2.50	<0.0400 mg/L	97.8	75-125			
Chromium	2.44 mg/L	0.100	mg/L	2.50	<0.100 mg/L	97.6	75-125			
Lead	2.43 mg/L	0.100	mg/L	2.50	<0.100 mg/L	97.3	75-125			
Selenium	2.45 mg/L	0.250	mg/L	2.50	<0.250 mg/L	98.0	75-125			
Silver	0.470 mg/L	0.100	mg/L	0.500	<0.100 mg/L	94.0	75-125			
Matrix Spike Dup (BEB0359-MSD1)	**Source: 21B0425-01**			Prepared & Analyzed: 02/11/2021						
Arsenic	2.58 mg/L	0.100	mg/L	2.50	<0.100 mg/L	103	75-125	0.398	20	
Barium	<5.00 mg/L	5.00	mg/L	2.50	<5.00 mg/L	114	75-125	0.182	20	
Cadmium	2.45 mg/L	0.0400	mg/L	2.50	<0.0400 mg/L	98.0	75-125	0.189	20	
Chromium	2.46 mg/L	0.100	mg/L	2.50	<0.100 mg/L	98.5	75-125	0.959	20	
Lead	2.46 mg/L	0.100	mg/L	2.50	<0.100 mg/L	98.2	75-125	0.911	20	
Selenium	2.45 mg/L	0.250	mg/L	2.50	<0.250 mg/L	98.1	75-125	0.149	20	
Silver	0.469 mg/L	0.100	mg/L	0.500	<0.100 mg/L	93.8	75-125	0.168	20	
Batch BEB0413 - SW7470A										
Blank (BEB0413-BLK1)				Prepared & Analyzed: 02/12/2021						
Mercury	<0.008 mg/L	0.008	mg/L							
LCS (BEB0413-BS1)				Prepared & Analyzed: 02/12/2021						
Mercury	0.049 mg/L	0.008	mg/L	0.0500	mg/L	98.7	80-120			
LCS Dup (BEB0413-BSD1)				Prepared & Analyzed: 02/12/2021						
Mercury	0.047 mg/L	0.008	mg/L	0.0500	mg/L	94.7	80-120	4.17	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 BEB0413 - SW7470A										
Matrix Spike (BEB0413-MS1)	**Source: 21B0425-01**			Prepared & Analyzed: 02/12/2021						
Mercury	0.050 mg/L	0.008	mg/L	0.0500	<0.008 mg/L	99.9	80-120			
Matrix Spike Dup (BEB0413-MSD1)	**Source: 21B0425-01**			Prepared & Analyzed: 02/12/2021						
Mercury	0.051 mg/L	0.008	mg/L	0.0500	<0.008 mg/L	102	80-120	2.33	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 BEB0400 - SW5030B										
Blank (BEB0400-BLK1)				Prepared & Analyzed: 02/11/2021						
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)	98.8		ug/L	100		98.8	80-120			
LCS (BEB0400-BS1)				Prepared & Analyzed: 02/11/2021						
Methyl-t-butyl ether (MTBE)	105 ug/kg	5.00	ug/kg	100	ug/kg	105	70-130			
Benzene	115 ug/kg	5.00	ug/kg	100	ug/kg	115	70-130			
Toluene	117 ug/kg	5.00	ug/kg	100	ug/kg	117	70-130			
Ethylbenzene	118 ug/kg	5.00	ug/kg	100	ug/kg	118	70-130			
m+p-Xylenes	234 ug/kg	10.0	ug/kg	200	ug/kg	117	70-130			
o-Xylene	112 ug/kg	5.00	ug/kg	100	ug/kg	112	70-130			
Surr: 2,5-Dibromotoluene (Surr PID)	109		ug/L	100	ug/L	109	80-120			
Matrix Spike (BEB0400-MS1)		**Source: 21B0425-04**		Prepared & Analyzed: 02/11/2021						
Methyl-t-butyl ether (MTBE)	104 ug/kg	5.00	ug/kg	94.5	<5.00 ug/kg	110	70-130			
Benzene	108 ug/kg	5.00	ug/kg	94.5	<5.00 ug/kg	114	70-130			
Toluene	107 ug/kg	5.00	ug/kg	94.5	<5.00 ug/kg	113	70-130			
Ethylbenzene	106 ug/kg	5.00	ug/kg	94.5	<5.00 ug/kg	112	70-130			
m+p-Xylenes	205 ug/kg	10.0	ug/kg	189	<10.0 ug/kg	109	70-130			
o-Xylene	98.5 ug/kg	5.00	ug/kg	94.5	<5.00 ug/kg	104	70-130			
Surr: 2,5-Dibromotoluene (Surr PID)	101		ug/L	100	ug/L	101	80-120			
Matrix Spike Dup (BEB0400-MSD1)		**Source: 21B0425-04**		Prepared & Analyzed: 02/11/2021						
Methyl-t-butyl ether (MTBE)	100 ug/kg	5.00	ug/kg	97.5	<5.00 ug/kg	103	70-130	3.43	20	
Benzene	103 ug/kg	5.00	ug/kg	97.5	<5.00 ug/kg	105	70-130	4.64	20	
Toluene	102 ug/kg	5.00	ug/kg	97.5	<5.00 ug/kg	104	70-130	5.17	20	
Ethylbenzene	99.8 ug/kg	5.00	ug/kg	97.5	<5.00 ug/kg	102	70-130	5.99	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 BEB0400 - SW5030B										
Matrix Spike Dup (BEB0400-MSD1)	**Source: 21B0425-04**		Prepared & Analyzed: 02/11/2021							
m+p-Xylenes	194 ug/kg	10.0	ug/kg	195	<10.0 ug/kg	99.4	70-130	5.83	20	
o-Xylene	92.7 ug/kg	5.00	ug/kg	97.5	<5.00 ug/kg	95.1	70-130	6.05	20	
Surr: 2,5-Dibromotoluene (Surr PID)	106		ug/L	100	ug/L	106	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 BEB0403 - SW3510C										
Blank (BEB0403-BLK1)				Prepared: 02/11/2021 Analyzed: 02/12/2021						
TPH-Semi-Volatiles (DRO)	<10.0 mg/kg	10.0	mg/kg							
Surr: Pentacosane (Surr)	3.55		mg/kg	4.99		71.2	45-160			
LCS (BEB0403-BS1)				Prepared: 02/11/2021 Analyzed: 02/12/2021						
TPH-Semi-Volatiles (DRO)	76.5 mg/kg	10.0	mg/kg	100	mg/kg	76.5	40-160			
Surr: Pentacosane (Surr)	3.42		mg/kg	5.00	mg/kg	68.5	45-160			
Matrix Spike (BEB0403-MS1)		**Source: 21B0516-06**		Prepared: 02/11/2021 Analyzed: 02/12/2021						
TPH-Semi-Volatiles (DRO)	84.4 mg/kg	10.0	mg/kg	100	<10.0 mg/kg	84.4	40-160			
Surr: Pentacosane (Surr)	3.75		mg/kg	5.00	mg/kg	75.0	45-160			
Matrix Spike Dup (BEB0403-MSD1)		**Source: 21B0516-06**		Prepared: 02/11/2021 Analyzed: 02/12/2021						
TPH-Semi-Volatiles (DRO)	93.8 mg/kg	10.0	mg/kg	98.6	<10.0 mg/kg	95.1	40-160	10.6	20	
Surr: Pentacosane (Surr)	4.03		mg/kg	4.93	mg/kg	81.8	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 BEB0391 - SW3550B										
Blank (BEB0391-BLK1)				Prepared: 02/11/2021 Analyzed: 02/12/2021						
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	0.0127		mg/kg wet	0.0167		75.9	30-105			
Surr: TCMX	0.0149		mg/kg wet	0.0167		89.3	30-105			
LCS (BEB0391-BS1)				Prepared: 02/11/2021 Analyzed: 02/12/2021						
PCB as Aroclor 1016	0.156 mg/kg wet	0.100	mg/kg wet	0.167	mg/kg wet	93.4	60-140			
PCB as Aroclor 1260	0.144 mg/kg wet	0.100	mg/kg wet	0.167	mg/kg wet	86.4	60-140			
Surr: DCB	0.0172		mg/kg wet	0.0167	mg/kg wet	103	30-105			
Surr: TCMX	0.0145		mg/kg wet	0.0167	mg/kg wet	87.0	30-105			
Matrix Spike (BEB0391-MS1)		**Source: 21B0518-01**		Prepared: 02/11/2021 Analyzed: 02/12/2021						
PCB as Aroclor 1016	0.254 mg/kg dry	0.110	mg/kg dry	0.183	<0.110 mg/kg	139	60-140			
PCB as Aroclor 1260	0.203 mg/kg dry	0.110	mg/kg dry	0.183	<0.110 mg/kg	111	60-140			
Surr: DCB	0.0152		mg/kg dry	0.0183	mg/kg dry	83.0	30-105			
Surr: TCMX	0.0178		mg/kg dry	0.0183	mg/kg dry	97.1	30-105			
Matrix Spike Dup (BEB0391-MSD1)		**Source: 21B0518-01**		Prepared: 02/11/2021 Analyzed: 02/12/2021						
PCB as Aroclor 1016	0.181 mg/kg dry	0.110	mg/kg dry	0.183	<0.110 mg/kg	98.5	60-140	33.8	20	P
PCB as Aroclor 1260	0.181 mg/kg dry	0.110	mg/kg dry	0.183	<0.110 mg/kg	98.5	60-140	11.8	20	
Surr: DCB	0.0159		mg/kg dry	0.0183	mg/kg dry	86.6	30-105			
Surr: TCMX	0.0158		mg/kg dry	0.0183	mg/kg dry	86.2	30-105			

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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 BEB0380 - SW3510C										
Blank (BEB0380-BLK1)				Prepared: 02/11/2021 Analyzed: 02/15/2021						
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)	0.00918		mg/L	0.0100		91.8	60-112			
LCS (BEB0380-BS1)				Prepared: 02/11/2021 Analyzed: 02/15/2021						
2,4,5-TP (Silvex)	0.004 mg/L	0.0005	mg/L	0.00500 mg/L		81.8	62-132			
2,4-D	0.004 mg/L	0.001	mg/L	0.00500 mg/L		88.4	74-139			
Surr: DCAA (Surr)	0.00907		mg/L	0.0100 mg/L		90.7	60-112			
Matrix Spike (BEB0380-MS1)		**Source: 21B0425-06**		Prepared: 02/11/2021 Analyzed: 02/15/2021						
2,4,5-TP (Silvex)	0.006 mg/L	0.0005	mg/L	0.00500	<0.0005 mg/L	112	52-129			
2,4-D	0.006 mg/L	0.001	mg/L	0.00500	<0.001 mg/L	117	53-126			
Surr: DCAA (Surr)	0.0119		mg/L	0.0100 mg/L		119	60-112			S
Matrix Spike Dup (BEB0380-MSD1)		**Source: 21B0425-06**		Prepared: 02/11/2021 Analyzed: 02/15/2021						
2,4,5-TP (Silvex)	0.006 mg/L	0.0005	mg/L	0.00500	<0.0005 mg/L	113	52-129	0.820	20	
2,4-D	0.006 mg/L	0.001	mg/L	0.00500	<0.001 mg/L	115	53-126	1.77	20	
Surr: DCAA (Surr)	0.0103		mg/L	0.0100 mg/L		103	60-112			

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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:	February 16, 2021 17:39 Shallow Water Dredging PCO2643144
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 BEB0442 - SW3510C										
Blank (BEB0442-BLK1)				Prepared: 02/12/2021 Analyzed: 02/15/2021						
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	0.00139		mg/L	0.00200		69.6	18-112			
Surr: DCB	0.000772		mg/L	0.00200		38.6	27-131			
LCS (BEB0442-BS1)				Prepared: 02/12/2021 Analyzed: 02/15/2021						
Endrin	<0.005 mg/L	0.005	mg/L	0.00100 mg/L		73.0	23-134			
Heptachlor	<0.005 mg/L	0.005	mg/L	0.00100 mg/L		62.5	23-134			
Heptachlor Epoxide	<0.005 mg/L	0.005	mg/L	0.00100 mg/L		70.8	23-134			
Methoxychlor	<0.005 mg/L	0.005	mg/L	0.00100 mg/L		82.5	23-134			
Surr: TCMX	0.00113		mg/L	0.00200 mg/L		56.3	18-112			
Surr: DCB	0.000678		mg/L	0.00200 mg/L		33.9	27-131			
LCS (BEB0442-BS2)				Prepared: 02/12/2021 Analyzed: 02/15/2021						
Toxaphene	<0.500 mg/L	0.500	mg/L	0.0250 mg/L		62.0	23-134			
LCS (BEB0442-BS3)				Prepared: 02/12/2021 Analyzed: 02/15/2021						
Chlordane	<0.030 mg/L	0.030	mg/L	0.0250 mg/L		95.4	23-134			
Matrix Spike (BEB0442-MS1)		**Source: 21B0425-05**		Prepared: 02/12/2021 Analyzed: 02/15/2021						
Endrin	<0.005 mg/L	0.005	mg/L	0.00100	<0.005 mg/L	51.3	23-134			
Heptachlor	<0.005 mg/L	0.005	mg/L	0.00100	<0.005 mg/L	54.6	23-134			
Heptachlor Epoxide	<0.005 mg/L	0.005	mg/L	0.00100	<0.005 mg/L	51.1	23-134			
Methoxychlor	<0.005 mg/L	0.005	mg/L	0.00100	<0.005 mg/L	54.9	23-134			
Surr: TCMX	0.00117		mg/L	0.00200 mg/L		58.4	18-112			
Surr: DCB	0.00117		mg/L	0.00200 mg/L		58.5	27-131			

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ENTHALPY ANALYTICAL
formerly Air, Water & Soil Laboratories

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

Certificate of Analysis

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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 BEB0442 - SW3510C										
Matrix Spike Dup (BEB0442-MSD1)	**Source: 21B0425-05**			Prepared: 02/12/2021 Analyzed: 02/15/2021						
Endrin	<0.005 mg/L	0.005	mg/L	0.00100	<0.005 mg/L	48.8	23-134	5.01	20	
Heptachlor	<0.005 mg/L	0.005	mg/L	0.00100	<0.005 mg/L	54.3	23-134	0.496	20	
Heptachlor Epoxide	<0.005 mg/L	0.005	mg/L	0.00100	<0.005 mg/L	48.7	23-134	4.69	20	
Methoxychlor	<0.005 mg/L	0.005	mg/L	0.00100	<0.005 mg/L	53.9	23-134	1.78	20	
Surr: TCMX	0.00111		mg/L	0.00200	mg/L	55.6	18-112			
Surr: DCB	0.00118		mg/L	0.00200	mg/L	58.8	27-131			

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Client Site I.D.:	Shallow Water Dredging		

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 BEB0457 - No Prep Wet Chem										
Blank (BEB0457-BLK1)				Prepared & Analyzed: 02/15/2021						
Percent Solids	100 %	0.10	%							
Duplicate (BEB0457-DUP1)		**Source: 21B0425-02**		Prepared & Analyzed: 02/15/2021						
Percent Solids	65.7 %	0.10	%		68.9 %			4.83	20	

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Client Site I.D.:	Shallow Water Dredging		

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,NCDEQ,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,NCDEQ
PCB as Aroclor 1221	VELAP,NCDEQ
PCB as Aroclor 1232	VELAP,NCDEQ
PCB as Aroclor 1242	VELAP,NCDEQ

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Certified Analyses included in this Report

Analyte	Certifications
PCB as Aroclor 1248	VELAP,NCDEQ
PCB as Aroclor 1254	VELAP,NCDEQ
PCB as Aroclor 1260	VELAP,NCDEQ
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
NCDEQ	North Carolina DEQ	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

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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1941 REYMET ROAD
RICHMOND, VIRGINIA 23237
(804) 358-8295 PHONE
(804)358-8297 FAX

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: Shallo Water Dredging
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	Herb, Pest, Predetermination SVOC TCLP	TPH-DRO SW 8015	MBTEX SW 8021	PCB SW 8082	Percent Solids	TCLP Metals		
1) Davis Up Creek	X					02/04/21	12:42	15:00	S	2								
2) Davis Down Creek	X					02/04/21	13:07	15:00	S	2								
3) Winter Up Creek	X					02/08/21	11:10	14:00	S	2								
4) Winter Down Creek	X					02/08/21	11:30	14:00	S	2								
5) HITW Landward	X					02/04/21	10:30	15:00	S	2								
6) HITW Bayward	X					02/04/21	10:50	15:00	S	2								
7)																		
8)																		
9)																		

ANALYSIS / (PRESERVATIVE)

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)

#277 no seals

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
[signature]	02/09/21 / 2:11	[signature]	2-9-21 14:11
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME

QC Data Package
Level III ☐
Level IV ☐

LAB USE ONLY COOLER TEMP 0.7 °C

Virginia Institute o 21B0425
Shallow Water Dredging
Recd: 02/09/2021 Due: 02/16/2021

21B0425

v130325002

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Sample Conditions Checklist

Samples Received at:	**0.70°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?	Yes
Do all bottle labels agree with custody papers?	Yes
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

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.

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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 Mathews County
Subdivision	Lot/Block/Parcel #

Name of water body(ies) within project boundaries and drainage area (acres or square miles).
Winter Harbor Haven and Chesapeake Bay

Tributary(ies) to: Winter Harbor Haven and Chesapeake Bay
Basin: Winter Harbor Haven Sub-basin: _____
(*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): 37.37108 / -76.25686
(Example: 37.33164/-77.68200) Placement site 37.391592°, -76.248817°; Upland disposal site 37.369654°,-76.258929°

USGS topographic map name: Mathews, Bethel Beach, New Point Comfort

8-digit USGS Hydrologic Unit Code (HUC) for your project site (See http://cfpub.epa.gov/surf/locate/index.cfm): 02080102
If known, indicate the 10-digit and 12-digit USGS HUCs (see http://consapps.dcr.virginia.gov/htdocs/maps/HUExplorer.htm) : _____ 020801020406

Name of your project (*Example: Water Creek driveway crossing*) Winter Harbor Channel Dredging

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): 40.4 acres (21 acres channel, 8 acres upland disposal site, 11.4 acres alongshore beneficial use)

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 Gloucester. Travel for about 10.5 miles to Main St. Turn right onto Main St. Travel for about 1.3 miles to VA-14 E/VA-3 W. Turn right onto VA-14 E/VA-3 W. Travel for 13 miles to Rt. 611. Turn right onto Rt. 611. Travel for about 2.5 miles to VA-14 E. Turn right onto VA-14 E. Travel for about 3.5 miles to Rt. 608, Potato Neck Rd. Turn right onto Rt. 608. Travel to the end of Rt. 608, about 4.2 miles. You have arrived at Winter Harbor.

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

If so, name those localities: Mathews, VA

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 Winter Harbor Inlet with dredged sandy material placement as beneficial use at the barrier in front of the northern portion of Winter Harbor and fine material placement at the upland disposal site of the marsh adjacent to Winter Harbor. Dredging of Winter Harbor is necessary to allow safe navigation for vessels utilizing Winter Harbor Haven. The channel will be dredged to a maximum depth of -7 ft MLLW including allowable overdepth and non-pay depth. The proposed channel is 8,500 ft long, including the channel and turning basin at the public ramp. Approximately 118,000 cy of material will be dredged (78,500 cy of sandy material, 39,500 cy of fines). The sandy material will be beneficial reuse by rebuilding a section of the barrier island north of the channel. The upland disposal site will be rehabilitated so that material can be placed there. Both disposal areas have a federal lease.

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.

Not applicable

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

Not applicable

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
Kevin Godsey	2163 Bethel Beach Rd.	Onemo	VA	23130
Joseph Carson, III	P.O. Box 1009	Mathews	VA	23109
Ryan & Brooke Collins	1508 Haven Beach Rd.	Diggs	VA	23045

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 NT	Beneficial Shoreline Placement F, T, SB		
Latitude / Longitude (in decimal degrees)	37.37108, -76.25686	37.369654°,-76.258929°	37.391592°, -76.248817°		
Wetland/waters impact area (square feet / acres)	914760 sq ft/ 21 acres		496584 sqft/11.4 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	Tidal			
Volume of fill below Mean High Water or Ordinary High Water (cubic yards)	0 cy	0 cy			

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	E2US2N			
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	Tidal			
Contributing drainage area in acres or square miles (*VMRC cannot complete review without this information*)	> 5 miles	> 5 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	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	

15. TIDAL/NONTIDAL SHORELINE STABILIZATION STRUCTURES (INCLUDING BULKHEADS AND ASSOCIATED BACKFILL, RIPRAP REVETMENTS AND ASSOCIATED BACKFILL, MARSH TOE STABILIZATION, GROINS, JETTIES, AND BREAKWATERS, ETC.) Information on non structural, vegetative alternatives (i.e., Living Shoreline) for shoreline stabilization is available at http://ccrm.vims.edu/coastal_zone/living_shorelines/index.html.

Is any portion of the project maintenance or replacement of an existing and currently serviceable structure? _____Yes _____No
If yes, give length of existing structure: _____ linear feet

If your maintenance project entails replacement of a bulkhead, is it possible to construct the replacement bulkhead within 2 feet channelward of the existing bulkhead? _____Yes _____No If not, please explain below:

Length of proposed structure, including returns: _____linear feet

Average channelward encroachment of the structure from Mean high water/ordinary high water mark: _____ feet Mean low water: _____feet	*Maximum* channelward encroachment of the structure from Mean high water/ordinary high water mark: _____ feet Mean low water: _____feet
Maximum channelward encroachment form the back edge of the Dune _____feet	*Maximum* channelward encroachment from the back edge of the Beach _____feet

Describe the type of construction including all materials to be used (including all fittings). Will filter cloth be used? ____Yes ____No

What is the source of the backfill material? _____

What is the composition of the backfill material? _____

If rock is to be used, give the average volume of material to be used for every linear foot of construction: _____cubic yards
What is the volume of material to be placed below the plane of ordinary high water mark/mean high water? _____cubic yards

For projects involving stone:
Average weight of core material (bottom layers): _____pounds per stone (Class_____)
Average weight of armor material (top layers): _____pounds per stone (Class_____)

Are there similar shoreline stabilization structures in the vicinity of your project site? _____Yes _____No
If so, describe the type(s) and location(s) of the structure(s):

If you are building a groin or jetty, will the channelward end of the structure be marked to show a hazard to navigation? _____Yes _____No	Has your project been reviewed by the Shoreline Erosion Advisory Service (SEAS)? _____Yes _____No If yes, please attach a copy of their comments.

16. BEACH NOURISHMENT

Source of material and composition (percentage sand, silt, clay): Winter Harbor Dredge (Sand 82%, Silt & Clay 18%)	Volume of material: 78,000 _____cubic yards

Area to be covered _____ square feet channelward of mean low water _____square feet channelward of mean high water

_____ square feet landward of mean low water _____square feet channelward of mean high water

Mode of transportation of material to the project site (truck, pipeline, etc.):
pipeline

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.

This project is for sand placement on a public beach. It is a beneficial use. On the upper terrace of the dredge material, beach grasses will be planted on a 1.5 ft grid resulting in approximately 191,000 plants used. The plants will be fertilized.

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	118,000	3,186,000						
Totals	118,000	3,186,000						

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).

Winter Harbor Inlet is a tidal creek located in rural Mathews County far removed from the sources of industrial contamination. Dredge material is relatively recently shoaled sediments migrating through the littoral system. Sediment was tested in 2 locations for chemicals and no contaminants were found.

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.

Sandy dredged material will be placed for beneficial use along Winter Harbor. Fine dredged material will be placed in an adjacent upland disposal area.

Will the dredged material be used for any commercial purpose or beneficial use? x Yes _____ No
If yes, please explain:

Sandy dredged material will be placed north aof the inlet to recreate a barrier island and protect shallow water habitat, SAV, and adjacent marsh from open Bay hydrodynamic conditions.

If this is a maintenance dredging project, what was the date that the dredging was last performed? 2010
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: >5 square miles	Average stream flow at site (flow rate under normal rainfall conditions): tidal 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.

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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.

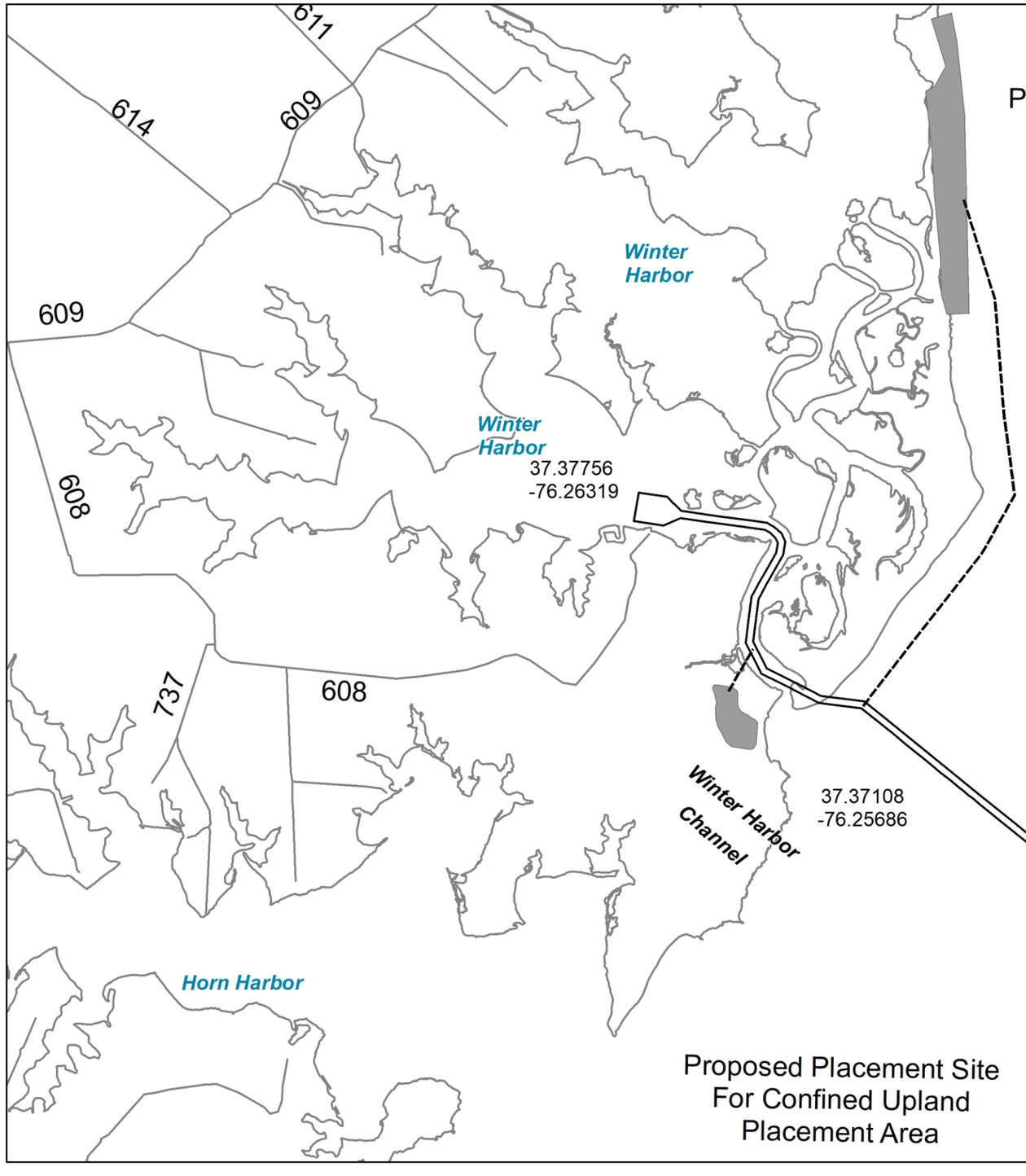
Pursuant to 9VAC25-830-110, *on-site delineation of the RPA is required for all projects in CBPAs*. Because USGS maps are not always indicative of actual "in-field" conditions, they may not be used to determine the site-specific boundaries of the RPA.

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 Sites
For Beneficial use of
Sandy Material

Typical Dredge Cut
Route: 7800 ft +/-

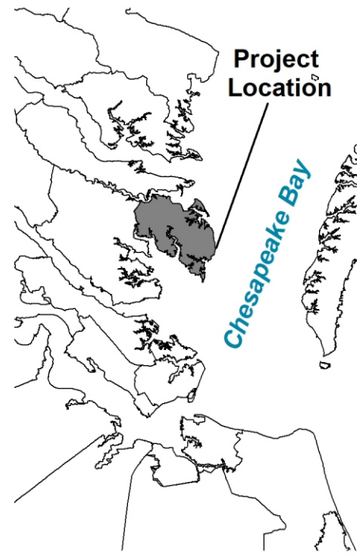
Proposed Placement Site
For Confined Upland
Placement Area

N
W E
S

0 2,000 4,000 Feet

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

Vicinity Map



N
W E
S

0 30 Miles

Virginia Institute of Marine Science
Gloucester County, Virginia

COVERSHEET

Plans for Dredging

Winter Harbor Channel
Mathews County
Virginia

SCALE: AS SHOWN ON SHEET

September 9, 2021

Joins Map 2

35+00
40+00
45+00
50+00
55+00
60+00
65+00
70+00
75+00
80+00
85+00

37.37241
-76.25793

37.37126-
76.25728

37.36985
-76.25265

37.37013
-76.25465

37.36458
-76.2448

Flood

Ebb

Chesapeake Bay

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 Winter Harbor, Virginia.
3. Soundings are in feet referred to mean lower low water (NOS) and were taken in October and November of 2020.
4. Mean tide range is 1.65 feet at Winter Harbor, Virginia, based on NOS observations, NTDE 83-01.
5. Benchmark is COE disk stamped "Winter 1977". Elevation = +7.07 ft above MLLW (NOS), NTDE 83-01.
6. Coordinates are in Latitude/Longitude

Virginia Geographic Information Network (V

EXISTING CONDITIONS MAP 1

WINTER HARBOR
MATHEWS COUNTY, VIRGINIA

SCALE: AS SHOWN

Aids to Navigation
- Other
- Green
- Red

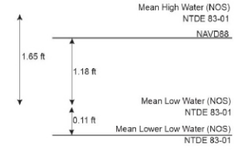
Channel Centerline
Winter Harbor Channel

N W E S

400 0 400
Feet

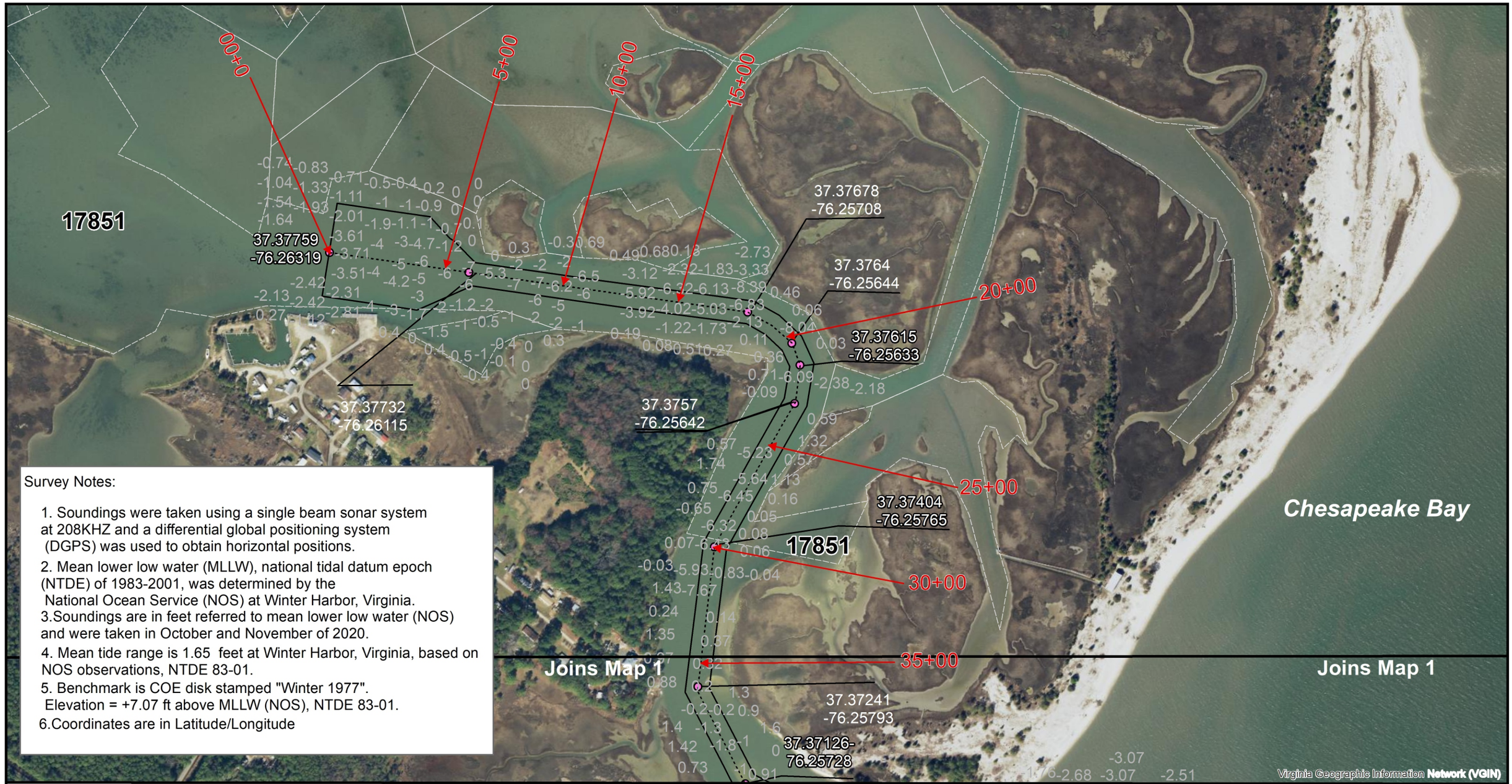
No Oyster leases and No SAV

Diagram of Datum Plane
National Tidal Datum Epoch (NTDE) 1983-2001



September 9, 2021

Shoreline Studies Program
VIMS



Survey Notes:

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6. Coordinates are in Latitude/Longitude

EXISTING CONDITIONS MAP 2

WINTER HARBOR
MATHEWS COUNTY, VIRGINIA

SCALE: AS SHOWN

Aids to Navigation
- Other
- Green
- Red

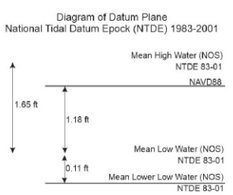
- Channel Centerline
- Winter Harbor Channel
- Private Oyster Leases

N
W E
S

400 0 400
Feet

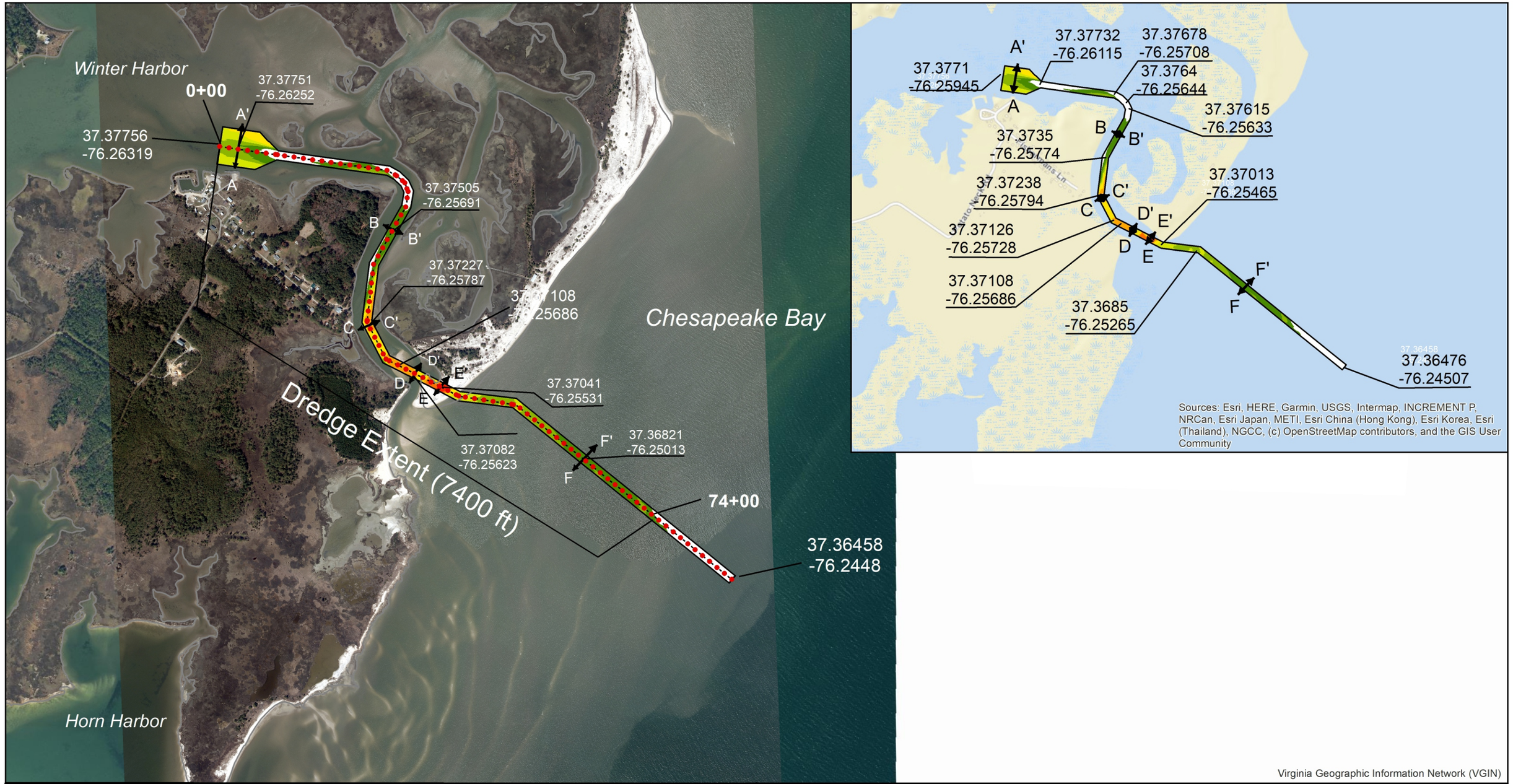
Private Oyster Leases

Lease Number: 17851
Lease Holder: Kevin Godsey



September 9, 2021

Shoreline Studies Program
VIMS



Virginia Geographic Information Network (VGIN)

Dredge Extent

Winter Harbor
Mathews County, Virginia

SCALE: AS SHOWN

N
W E
S

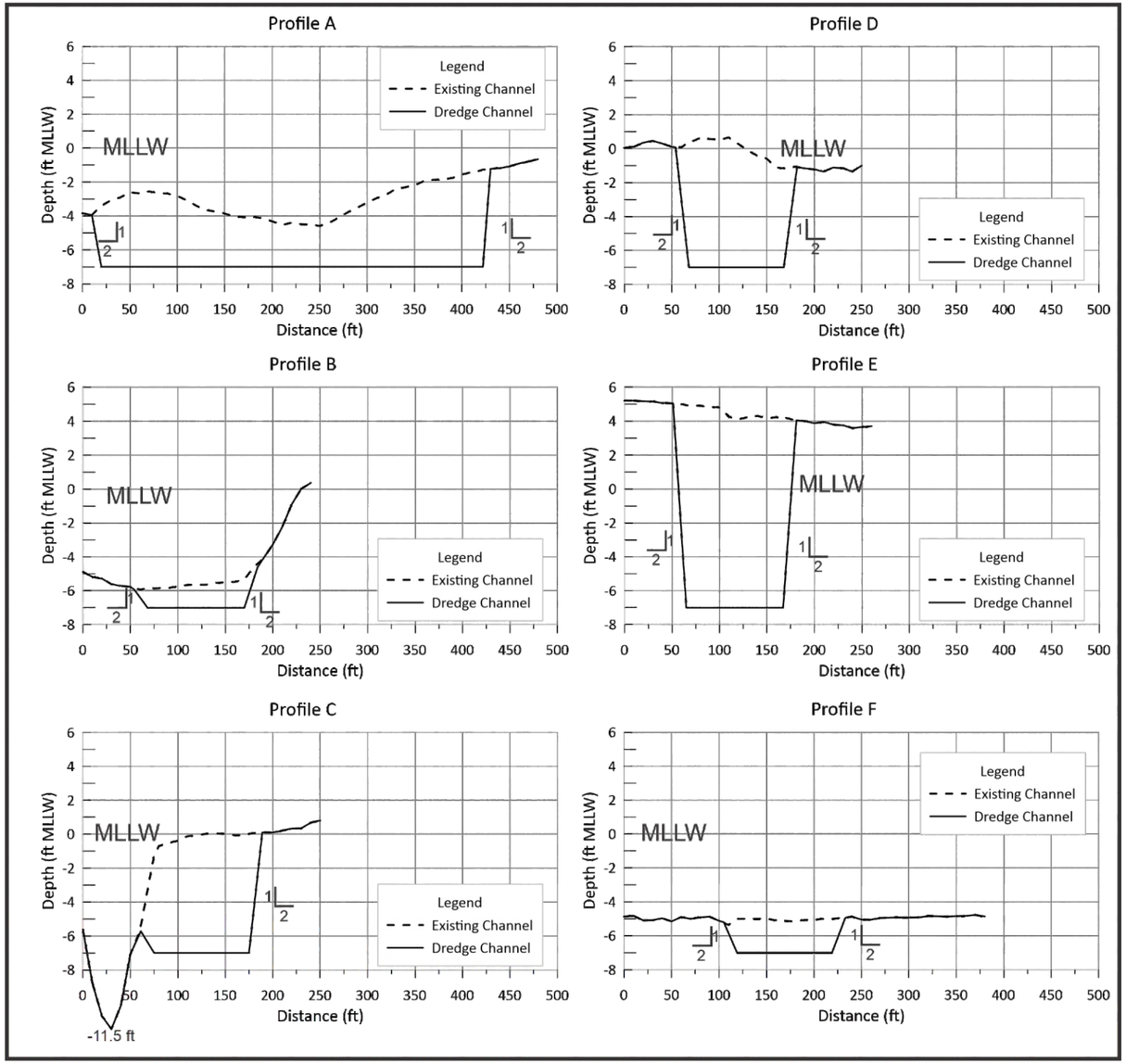
1,000 0 1,000
Feet

Channel Centerline
Winter Harbor Channel
2019 Aerial Image overlaid on top of VBMP 2017 WGS

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

Shoreline Studies Program
VIMS

September 9, 2021



CROSS-SECTIONS
Winter Harbor Channel
Mathews County, Virginia

Scale: As Shown

Shoreline Studies Program
VIMS

September 9, 2021

RESOURCES

WINTER HARBOR
MATHEWS COUNTY, VIRGINIA

SCALE: AS SHOWN Image: NAIP 2018

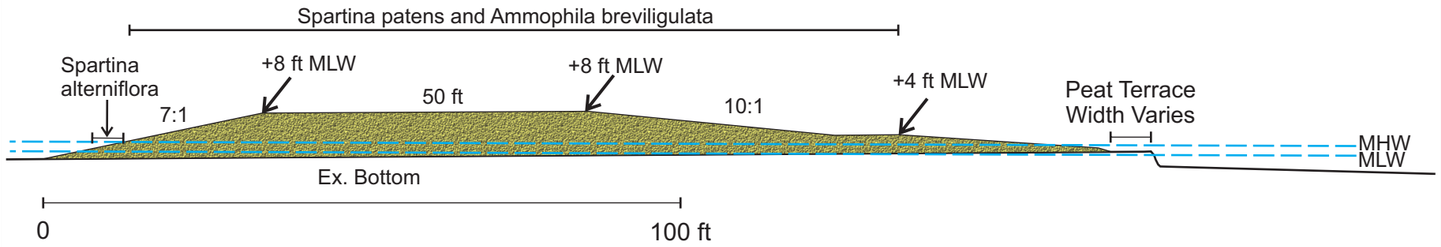
National Wetlands Inventory

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

Shoreline Studies Program VIMS

September 9, 2021

Typical Cross-section for Northern Proposed Placement Area



CROSS-SECTIONS
Winter Harbor Channel
Mathews County, Virginia

Scale: As Shown

Shoreline Studies Program
VIMS

September 9, 2021