

BULK CHEMISTRY DREDGE SEDIMENT SAMPLING and HARBOR ASSESSMENT REPORT

**PORTLAND HARBOR
PORTLAND AND SOUTH PORTLAND, MAINE**

**Grant Number: BF – 00A00040-1
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C A M P B E L L
ENVIRONMENTAL GROUP

November 21, 2019

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Re: Draft Bulk Chemistry Dredge Sediment Sampling and Harbor Assessment Report
Portland Harbor

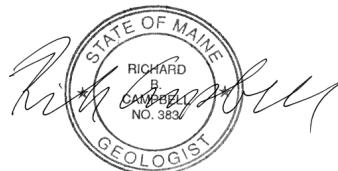
Dear Tom,

Campbell Environmental Group, Inc., (CEG) and its teaming partner Stantec Consulting Services Inc. (Stantec) prepared this report for the Portland Harbor Commission to document the results of the dredge planning, bulk chemistry dredge sediment sampling, and environmental assessment conducted in Portland Harbor in both Portland and South Portland, Maine.

The purpose of this report is to provide the Portland Harbor Commission with results of the dredge planning, data regarding the chemical characteristics of the sediment proposed to be dredged and associated environmental assessments. This work was conducted as part of the United States Environmental Protection Agency (USEPA) Brownfields contract.

If you have any questions or comments, please do not hesitate to contact us. CEG appreciates working with you on this project.

Sincerely,



Glenn Daukas
Senior Geologist

Richard Campbell
Maine Certified Geologist
President

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EXECUTIVE SUMMARY

Campbell Environmental Group, Inc. (CEG) and its teaming partner Stantec Consulting Services Inc. (Stantec) (CEG Team) were retained by the Portland Harbor Commission (PHC) to prepare this Bulk Chemistry Dredge Sediment Sampling and Harbor Assessment Report.

This report documents the results of the dredge planning, bulk chemistry sediment sampling, and environmental assessment program conducted by the CEG Team, between January 2015 and September 2019, in Portland Harbor, Portland and South Portland, Maine. This work was conducted as part of the Portland Harbor Commission's United States Environmental Protection Agency (USEPA) 104(k) Site Specific Assessment Grant.

The PHC, in cooperation with the cities of Portland and South Portland, and the State of Maine Port Authority are working together to improve the sediment and water quality and commercial economic growth for Portland Harbor.

Previous planning and testing efforts have identified that the sediments within the piers or waterfront properties will not meet the most cost-effective disposal option of offshore disposal. Lead by the City of Portland, a Non-Federal Dredge (NFD) work group was organized in 2014. The NFD, in consultation with State and Federal Agencies, identified that the preferred disposal alternative is for sediments dredged from Portland Harbor to be placed into a Confined Aquatic Disposal (CAD) cell. This CAD Cell will provide a cost-effective mechanism to place dredged sediment unsuitable for open-water disposal. The City of Portland, Maine, is currently engaged in designing and permitting a cost-effective strategy for the disposal of the harbor sediments utilizing a CAD cell in Portland Harbor.

The scope of work completed as part of this grant included:

- Collection and analytical analysis of bulk sediment samples from the participating wharves and waterfront properties in Portland and South Portland;
- Completion of eelgrass and lobster surveys;
- Development of dredge area and depth prisms;
- Calculation of proposed dredge volumes; and
- Completion of a cultural and historical assessment.

Because dredged sediments will be sequestered in the CAD cell, the Maine Department of Environmental Protection (MEDEP) and the United States Army Corp of Engineers (USACE) have determined that proposed analytical sampling will be conducted for waste characterization and dredge worker health and safety purposes only.

The Maine Remedial Action Guidelines (RAGs) for Sites Contaminated with Hazardous Substances, October 19, 2018, Construction Worker Scenario Guidelines were used for comparison purposes. Lead and/or mercury were detected exceeding the Construction Worker

RAGs at Union Wharf, Wright Wharf, and Portland Pier. Benzo(a)pyrene was detected exceeding the Construction Worker RAG at Union Wharf and Holyoke Wharf.

As part of the permitting process, the MEDEP and the USACE requested eelgrass habitat surveys of any project dredged within the boundaries of historically mapped eelgrass beds. Eelgrass was observed at both the East End Beach and Spring Point Marina. Based on the survey, the proposed dredge area at the East End Beach includes approximately 3% of the MEDEP 2018 mapped eelgrass bed. The proposed dredge area at the Spring Point Marina includes approximately 2% of the 2018 MEDEP mapped bed. Additionally, the Maine Department of Marine Resources requested a lobster survey of the Ocean Gateway dredge area. No lobsters were observed during the survey.

The total proposed dredge volume from the participating wharves and waterfront properties is 244,678 cubic yards, which encompasses a dredge area footprint of 2,038,000 square feet.

Several activities are planned in the fall of 2019 to further develop the design and permitting strategy including the following:

- Finalizing draft dredge figures, plan views and cross-sections being developed for 30% design; and
- Completing draft permit application and technical reports and alternatives analysis.

This project must obtain permits from local, state and federal agencies. The CEG Team has held multiple regulatory meetings with Portland and South Portland, MEDEP and USACE to discuss the most expeditious permitting path for these unique and complex projects. For the Dredge Project, the agencies have recommended an umbrella permit with the PHC as the applicant that covers all the individual pier and marina owners. The CAD Cell will have a separate permit with the City of Portland as the applicant. The CEG Team is working to synchronize the applications so that the CAD Cell will be permitted at the same time as the Dredge Project. The CEG Team is working to obtain permitted projects by June 2020.

1.0 INTRODUCTION

Campbell Environmental Group, Inc. (CEG) and its teaming partner Stantec Consulting Services Inc. (Stantec) (CEG Team) were retained by the Portland Harbor Commission (PHC) to prepare this Bulk Chemistry Dredge Sediment Sampling and Harbor Assessment Report. This report documents the results of the dredge planning, bulk chemistry sediment sampling, and environmental assessment program conducted by the CEG Team, between January 2015 and September 2019, in Portland Harbor, Portland and South Portland, Maine (Project Area). This work was conducted as part of the Portland Harbor Commission's United States Environmental Protection Agency (USEPA) 104(k) Site Specific Assessment Grant supporting preparation of US Army Corps of Engineers (USACE) and Maine Department of Environmental Protection (MEDEP) dredge permits.

The PHC, in cooperation with the cities of Portland and South Portland, Maine and the State of Maine Port Authority are working together to improve the sediment and water quality and commercial economic growth for Portland Harbor. Portland Harbor is an important economic hub for the State of Maine providing public infrastructure that supports many diverse industries. The economic growth of Portland Harbor has been impacted by sedimentation within the wharves and waterfront areas that limits water depth for commercial and recreational vessels. Historic sedimentation has made portions of the immediate waterfront unusable and in some areas, bottom sediments are exposed at low tide where vessels were once able to dock.

This project addresses a significant barrier to investment and economic growth on the Portland Harbor waterfront, which is the unknown environmental risk associated with harbor sediments. Wharf and waterfront property owners are confronted with "legacy contaminants" from long departed industries, which they did not contribute to. As a result, potentially contaminated sediments require expensive testing that may not allow for open-water disposal. Alternatively, extremely expensive upland disposal would be required. Wharf owners are hesitant to conduct testing only to determine dredge disposal costs are prohibitive. Since no sampling has been conducted to determine if costly upland disposal is required, disposal costs cannot be determined and waterfront owners and potential investors/lenders assume the worst case. As a result, dredging has not taken place for decades and in some locations for over 70 years.

The City of Portland is currently engaged in designing and permitting a cost-effective strategy for the disposal of the harbor sediments utilizing a confined aquatic disposal (CAD) cell in Portland Harbor. Sediments dredged from within the wharves and waterfront areas will be placed in the CAD cell, which will provide an economically viable and environmentally sound alternative for the disposal of dredge sediments.

1.1 Purpose

The goal of this project is to collect necessary environmental data to prepare State and Federal dredge permits for the participating wharves and waterfront properties in Portland Harbor. The

proposed dredge areas associated with the participating wharves and waterfront property owners in both Portland and South Portland are presented in [Appendix A](#).

The CAD cell will provide a mechanism to place dredged sediment unsuitable for offshore open-water disposal. The impacted sediments are continually re-suspended into the water column during storms, low tides, and interaction with propeller wash during vessel berthing leading to water quality issues that have been prevalent for decades. Because dredged sediments will be sequestered in the CAD cell, the MEDEP and the USACE have determined that proposed analytical sampling will be conducted for waste characterization and dredge worker health and safety purposes only.

2.0 SITE DESCRIPTION

The Project Area consists of select private and public wharves and waterfront properties, located in Portland and South Portland, Maine whose owners have elected to participate in the dredge project. The project includes 47 properties along Portland Harbor's waterfront adjacent to private and publicly owned piers and waterfront areas, including 21 piers, 10 marinas/boat yards, the Portland public boat launch, and the Portland commercial barge landing. The purpose of the sediment investigation is to characterize the sediment proposed for dredging that will be disposed of in the CAD cell. The participating properties in the dredge project are presented in [Appendix A](#).

Detailed figures for each wharf and waterfront property are presented in [Appendix B](#). The information presented on each of the Appendix B figures includes:

- Wharf owner Tax Parcel and Map/Lot information;
- Dredge prism location;
- Anticipated water depth for each dredge prism after dredging;
- Vibracore sediment sample locations;
- Approximate location of historical industrial activities;
- Bathymetry survey water depths. A notation “-3” indicates a water depth of three feet below Mean Lower Low Water (MLLW); and
- Estimated dredge volume.

The Portland Harbor is located on the Fore River at the southwestern end of Casco Bay. The main harbor is located at the mouth of the Fore River, where most of the wharves are located. The inner harbor is located up-river west of the Casco Bay Bridge. The Fore River roughly splits the harbor with the City of Portland on the northern shore and the City of South Portland on the southern shore. Portland Harbor covers approximately 2,000 acres of land.

Current Portland waterfront use in the main harbor area consists primarily of docking for various marine crafts ranging from cruise ships and ferries to smaller fishing and lobster boats. The

Portland waterfront also includes dockside restaurants, historic architecture, harbor tours, and local and international ferry service.

The Portland waterfront is generally described with three overlapping sub-districts:

- Western Waterfront: Dedicated to freight and industrial uses and a commercial marina that need access to the deep water of the harbor's maintained dredged channel.
- Eastern Waterfront: Home to Portland's passenger port with Casco Bay Island ferry service, international ferry service, and cruise ship facilities.
- Central Waterfront: Between east and west waterfront, the 19th century piers and wharves support traditional fishing, marine research, tourism, and non-marine uses. The Central Waterfront is tightly connected with Portland's historic Downtown, Arts, and Old Port shopping districts.

The South Portland waterfront use consists primarily of a mix of pleasure craft marinas and commercial bulk petroleum wharfs.

2.1 Site History and Land Use

The following historical information was derived from numerous publicly available historical documents and Sanborn Insurance Maps. Portland and South Portland, Maine, are maritime cities whose histories are inextricably tied to the waterfront. The harbor is one of the deepest on the East Coast and served as the staging area for the Atlantic Fleet during World War II. While the Portland Harbor waterfront provides several functions including urban, industrial, transportation, and retail centers, its primary role is as an economic center for water-dependent businesses, which cannot exist elsewhere.

In 1633, the Portland peninsula was settled by the British as a fishing and trading village. Following the American Revolution, Portland Harbor began to grow rapidly as a shipping center. Over the years, Portland Harbor was host to a variety of industries including a coal gasification facility, a paint factory, a locomotive foundry, and machine shops. These manufacturing facilities have all but disappeared leaving Brownfields sites or businesses that have been built upon their remains.

Sanborn maps show South Portland evolving into a port city with military bases and shipyards, along with metal-working and machining. In the 1960s and 1970s, high-tech manufacturing became important.

The major historical industrial activities on the Portland side of the harbor included canneries, petroleum storage and distribution facilities, and coal storage and distribution. The fish, vegetable, and meat canneries produced biological waste, but it was the cans themselves that had a potentially lasting effect on the harbor. It wasn't until the 1920s that this industry began moving away from lead solder; until then, the toxic metal would have been in plentiful supply at these waterfront factories. The early petroleum industry may be responsible for some of the

polycyclic aromatic hydrocarbons (PAH) pollution that is common in the sediments. The tank farms that were established in the 1920s eventually formed a regional hub for transportation of petroleum from Portland Harbor to Montreal, Canada. PAHs are a large family of hydrocarbons, a number of which are also carcinogenic. The petroleum business also brought more lead to the area, first as an additive to oils (1900), then to gasoline (from 1922 to the 1970s).

Since the late 1800s the major industrial activities conducted on the South Portland harbor waterfront consisted of shipyards and vessel services. South Portland was the location of a large naval shipyard for the construction of Liberty transportation ships. Figures presenting the locations of these industries on the Portland Harbor wharves and waterfronts are presented in [Appendix B](#). These locations were determined through the use of Sanborn Insurance Maps. A summary of the industries and pier locations are presented in [Table 1](#).

Table 1
Participating Wharfs and Historic Wharf Use

Wharf Name	Location	Historic Use/Potential Source Areas
East End Beach	Portland, Maine	Historical glass manufacturing; Storm water outflow.
Ocean Gateway	Portland, Maine	Boat and Railroad Manufacturing; Combined Storm Water/Sewer Outflow.
Maine State Pier	Portland, Maine	Coal Storage and Handling; Combined Storm Water/Sewer Outflow.
Maine Wharf	Portland, Maine	Coal Storage and Handling; Electric Motor Repair
Custom House Wharf	Portland, Maine	Machine Shop/Auto & Boat Repair; Paints and Oils.
Portland Pier	Portland, Maine	Paints & Gasoline Storage; Motor Works;
Long wharf	Portland, Maine	Coal Storage and Handling; Combined Storm Water/Sewer Outflow.
Chandlers' Wharf	Portland, Maine	Canning and Molasses Production
Widgery's Wharf	Portland, Maine	Fertilizer Storage
Union Wharf	Portland, Maine	Sardine Packing; Machine Shop
Portland Fish Pier	Portland, Maine	Coal Storage and Handling; Canning
Portland Terminal Co./Wright Wharf	Portland, Maine	Machine Shop; Combined Storm Water/Sewer Outflow; Storm Water Outflow.
Hobson's Pier	Portland, Maine	Lumber Storage
Berlin Mills Wharf	Portland, Maine	Navy Machine Shop.
Holyoke Wharf	Portland, Maine	Fish Processing.
Sturdivant's Wharf	Portland, Maine	Above Ground Coal Tar Storage and Distribution Tanks.
Deake's Wharf	Portland, Maine	Sardine Processing.
Portland Yacht Services	Portland, Maine	Coal Gasification Plant.
Ricker's Wharf/Cianbro	Portland, Maine	Coal and Other Bulk Materials Handling; Storm Water Outflow.
Turner's Island	South Portland, Maine	Heavy Industry/Ship Building & Repair
South Port Marina	South Portland, Maine	Boat Maintenance and Repair; Storm Water Outflow.

Wharf Name	Location	Historic Use/Potential Source Areas
Centerboard Yacht Club	South Portland	No Documented previous Use in Dredge Area.
Aspasia/Sunset Marina	South Portland	Heavy Industry/Ship Building & Repair.
City of South Portland Commercial Pier	South Portland, Maine	Heavy Industry/Ship Building & Repair.
Port Harbor/Breakwater Marina	South Portland, Maine	Heavy Industry/Ship Building & Repair.
Liberty Shipyard	South Portland, Maine	Heavy Industry/Ship Building & Repair.

2.2 Summary of Previous Assessments

The previous investigatory work that the CEG team completed in support of the PHC grant included the following activities:

- Stakeholder and Agency Meetings - the CEG Team organized and held multiple stakeholder meetings including, Brownfields Steering Committee meetings, meetings with the cities of Portland and South Portland, Maine, meetings with the MEDEP and USACE.
- Project Outreach - the CEG Team collaborated with and provided updates to waterfront organizations such as Waterfront Alliance, Portland Propeller Club, Friends of Casco Bay, and the State of Maine Dredge Committee.
- Waterfront Research and Database - the CEG Team conducted desktop analysis to determine wharf/waterfront ownership and gather contact information and Submerged Lands Lease holdings. Information including storm water and combined storm water/sewer outflow locations were identified and uploaded into an Excel and GIS databases that was created for the project.
- Historic Use - A review of Sanborn Fire Insurance Historical maps was conducted to determine historical manufacturing located on specific wharfs/waterfront areas.
- Individual one on one meetings with wharf/waterfront owners to determine dredging needs including locations and desired water depths.
- Bathymetry survey of the outer Portland Harbor area including the participating wharfs and waterfront areas.
- Preparation of figures for individual wharfs and waterfront properties depicting the bathymetry survey data, proposed dredge depths, and thickness of required sediment removal required; and
- Calculating preliminary dredge volumes for each individual wharf/waterfront property.

3.0 PHASE II ACTIVITIES

The following subsections outline the PHC's approved scope of work including field investigation methods and the associated analytical program.

3.1 Scope of Assessment

The following section presents a detailed description of the field investigation tasks completed to characterize and sample marine sediment located between the wharves and along the waterfront in Portland Harbor.

The CEG Team completed the following scope of work:

- Prepared and submitted a Site Specific Quality Assurance Project Plan (SSQAPP) and cost estimate for approval;
- Prepared a Site Specific Health and Safety Plan (HASP);
- Completed an eelgrass and lobster surveys- In consultation with MEDEP and Maine Department of Marine Resources (MDMR), within select target dredge areas;
- Conducted a cultural and historic resources assessment- In consultation with the Maine Historic Preservation Committee (MHPC), the CEG Team completed a cultural resource assessment that determined there were no significant cultural or historic resources associated with the proposed dredge areas.
- Completed two vibracore samples per wharf/waterfront area for a total of 30 vibracores. Sample locations were prioritized to reflect target dredge depths, areas near combined sewer overflows (CSOs) or storm water outfalls, and inner and outer portions of dredge areas (Appendix B);
- At each sampling location, collected vibracores across the proposed dredge sediment excavation horizon;
- Described and documented sediment horizons based on the modified Burmister Method (Appendix C);
- Composited the 30 discrete sediment cores into 15 composite sediment samples (per wharf/waterfront area);
- Submitted 15 composite sediment samples and associated quality control and quality assurance samples for USACE Regional Implementation Manual for the Evaluation of Dredge Materials Proposed for Disposal in New England Waters, April 2004 (RIM), bulk chemistry sampling analytical requirements;
- For dredge design, collected and archived a sediment sample from representative sediment horizons from each of the 15 composite sediment samples for potential Atterberg limit analysis;
- Conducted a location survey of the sampling points using a global positioning system (GPS);
- Prepared a report summarizing the methods and results of the investigation; and
- Prepared dredge prisms and calculated dredge volumes.

Two wharf areas, Turner's Island and Liberty Shipyard, both entered into this project after the sediment sampling program had been conducted. As a result, Liberty Shipyard does not have corresponding sediment analytical data. However, Turner's Island conducted a sediment sampling program on their own and this data is included in Appendix J.

3.2 Field Exploration Methods, Sampling and Chemical Analyses

The following section presents a detailed description of the field investigation tasks that were used to investigate the Portland Harbor sediments. Sample locations are presented on figures in Appendix B. To complete the prosed investigation, CEG subcontracted with:

- Alpha Analytical Laboratories, Westborough, MA, for analytical services;
- Apex Companies, LLC., of Boston, Massachusetts, for vibracore sampling services; and
- Stantec, Scarborough, Maine, for vibracore support and data validation.

Analytical samples were labeled in accordance with Section 5.30 of CEG's Generic QAPP as follows:

- VB-1 = Vibracore Sediment Location;
- CSP-1 = Composite Sample Portland; and
- CSS-1 = Composite Sample South Portland.

3.2.1 Sediment Sampling

CEG collected two vibracore samples per wharf/waterfront area as outlined in Table 2 and presented in the Sample Location Figures in Appendix B. The samples were collected utilizing Apex's mobile vibracore system consisting of a 25-foot pontoon boat. Vibracore sampling was conducted in accordance with Apex's Marine Sediment Sampling with a Vibracore System Standard Operating Procedure.

The proposed vibracore sample locations were selected in consultation with the MEDEP and USACE based on proximity to storm water and combined sewer outflow locations, depth of proposed sediment dredging, and proximity to historical industrial activities. A CEG geologist collected, logged, and screened sediment samples from each vibracore. Individual vibracore logs are presented in Appendix D.

The depths presented in Table 2 include both "Sample Depth" and "Dredge Max Depth". The numbers presented indicate the vertical thickness of the sediment to be dredged. For example, a "Sample Depth" of 4.0 feet indicates that a sediment core sample was collected, at that location, from the harbor floor to a depth of 4.0 feet beneath the harbor floor. The "Dredge Max Depth" indicates the maximum depth of excavation at the specified dredge area. Selected sample locations are typically not at the same location as the greatest excavation depth, although we tried to select one sample location as close to the "Dredge Max Depth" as possible.

The "Sample Depths" were determined based on proposed dredge depth at the actual sample location. The sample locations were selected in a meeting attended by the MEDEP and the USACE on July 11, 2017. The selections were made on a wharf by wharf basis after reviewing the following data recommended by the agencies:

- a) Proximity to a storm water or combined storm water/sewer outflow location;
- b) Distributing the two sample locations so that one location was closer to the land and the second was closer to the outer end of the wharf;
- c) Proximity to known historical industrial activities; and
- d) Depth of proposed sediment dredge at the selected sample location in relation to the proposed maximum dredge depth.

The volume of material proposed to be dredged varies significantly between dredge areas. The process to determine the depths (and volumes) started with a waterfront owner requesting a specific depth of water at MLLW at a specific area(s) along their property. The CEG Team then conducted a bathymetry survey to determine the current depth of water in the target dredge area. Based on that data, we determined the depth (thickness) of sediment that is required to be removed to produce the final targeted water depth. Typically, the thickness of sediment to be removed is not uniform across the proposed dredge area and commonly thins as you move out towards the harbor channel.

The sample frequency is based on two samples per dredge area regardless of the volume of proposed dredge material. The idea of volume weighted sampling was discussed at our sample location selection meeting and it was agreed that we did not need to weigh the sample numbers by volume to get the data the MEDEP required.

Table 2
Sediment Sample Locations

Location	CSP/ CSS ID No.	VB ID No.	Sample Depth	Dredge max depth	Rationale
East End Beach	1	1	6.0	6.1	Representative Dredge Depth.
		2	6.0	6.4	Inner portion of dredge prism, near storm water outfall.
Amethyst Lot	2	3	6.0	7.8	Inner portion of dredge prism near storm water outfall.
		4	6.0	9.7	Representative Dredge Depth.
Maine State Pier/Ocean Gateway	3	5	5.0	5.7	Representative Dredge Depth.
		6	7.5	11.4	Inner portion of dredge prism near CSO
Maine Wharf	4	7	9.5	10.6	Inner portion of dredge prism near CSO
		8	5.5	7.0	Outer portion of main dredge prism in representative Dredge Depth.
Portland Pier	5	9	5.5	11.0	Inner portion of main dredge prism.
		10	3.5	5.6	Outer portion of dredge prism in representative Dredge Depth.
Chandler's Wharf	6	11	4.5	7.0	Inner portion of dredge prism near CSO.
		12	4.0	11.0	Outer portion of dredge prism in representative Dredge Depth.
Union Wharf	7	13	6.0	6.0	Inner portion of dredge prism.
		14	6.0	6.2	Outer portion of dredge prism near storm water

Location	CSP/ CSS ID No.	VB ID No.	Sample Depth	Dredge max depth	Rationale
					outfall.
Portland Terminal Co/Wright Wharf	8	15	8.5	11.0	Inner portion of dredge prism near storm water/CSO outfall.
		16	5.5	6.0	Outer portion of dredge prism.
Holyoke Wharf	9	17	2.0	9.0	Inner portion of dredge prism.
		18	5.5	7.7	Outer portion of dredge prism in representative Dredge Depth.
Deake's Wharf	10	19	4.0	5.2	Inner portion of dredge prism near historical coal tar contamination.
		20	10.0	16.4	Outer portion of dredge prism.
Portland Yacht Services	11	21	4.5	7.2	Representative Dredge Depth.
		22	10.0	13.0	Representative Dredge Depth.
Ricker's Wharf/Cianbro	12	23	6.0	11.0	Inner portion of dredge prism near storm water outfall.
		24	0.0	15.7	Outer portion of dredge prism.
South Port Marina	13	25	4.5	7.0	Inner portion of dredge prism near storm water outfall.
		26	5.0	8.2	Outer portion of dredge prism.
Aspasia/Sunset Marina	14	27	6.0	6.0	Inner portion of dredge prism.
		28	3.5	9.5	Outer portion of dredge prism.
Port Harbor/Breakwater Marina	15	29	0.0	2.5	Inner portion of dredge prism near storm water outfall.
		30	6.0	5.0	Outer portion of dredge prism.

One vibracore sediment sample was collected at each of the proposed 30 vibracore locations.

Two vibracore locations were collected at each wharf/waterfront area. Sediment samples from each of the vibracore pairs were composited creating a total of 15 composite analytical sediment samples.

Apex provided a fully equipped vessel including vibracore sampling tools, GPS capacity, and uploading software. The vibracore sampler employed up to a ten-foot polycarbonate and/or polypropylene core barrel and sample sleeves to collect sediment samples from the dredge prisms. The vibracore head is an aluminum-encased vibratory motor used to advance the core barrel into the sediment. When the core barrel reached refusal or the desired depth, a measurement was taken to determine the final depth of penetration. The vibracore was then retrieved on board the vessel, removed from the core barrel, measured, described, and sampled. Composite sampling was conducted in accordance with Section 2.3.3 of Apex's Vibracore SOP ([Appendix E](#)). The following presents the composite sampling procedure:

- Retrieved the sample and removed the sample sleeve;
- Cut the sample sleeve in half lengthwise;
- Described the sediment horizons based on the modified Burmister Method ([Appendix C](#));
- Collected representative grain size and/or Atterberg limit samples from sediment horizons to be used in dredge design;

- Collected a representative sediment sample from across the entire sample core from both sample pair locations and placed in a clean stainless-steel mixing bowl;
- Completely mixed the sediments and filled the appropriate laboratory supplied sample containers; and
- Logged and labeled; in the log, it was noted which locations (full name, see Section 5.0) were composited in which composite sample.

3.2.2 Surveying

The field sampling locations were uploaded into Hypack software aboard the sampling vessel to accurately identify each location. Anchors were deployed to stay on position during each sampling event, unless there were favorable weather conditions in which the captain could adequately hold position. Once the sampling vessel was on station, depth of water and tide values were taken to determine the elevation of the mud-line at the sample location, the GPS coordinates were recorded, and water depth logged. Tide elevations were continuously monitored during sample collection efforts so that actual mud-line elevations could be ascertained.

3.2.3 Decontamination and Investigation Derived Wastes

Decontamination of non-dedicated equipment between sampling sites was conducted using an Alconox wash followed by a distilled water rinse in accordance with Section 5.1 of the CEG Generic QAPP. Sediment samples were collected utilizing dedicated polycarbonate (Lexan) core tube and/or polypropylene sleeves.

Investigation derived wastes, including decontamination fluids and marine sediment samples, were placed back into the water at each investigation location.

4.0 EELGRASS AND LOBSTER SURVEYS

As part of the dredge permitting process the MEDEP and the USACE requested eelgrass (*Zostera marina*) habitat surveys on any project dredge area within the boundaries of historically mapped eelgrass beds. Additionally, MDMR requested an American lobster (*Homarus americanus*) surveys of project dredge areas that had sufficient water depth to support lobster in the winter months when dredging would occur.

Detailed eelgrass and lobster survey reports methodologies and details results are presented in [Appendix F](#). The detailed lobster survey report also includes a summary of lobster life history specific to water temperature expected during the allowable dredge window (November 1 to March 15), as well as a summary of past lobster relocation efforts in Portland Harbor.

4.1 Eelgrass Survey

Stantec conducted the eelgrass survey in September 2017. A detailed eelgrass survey report is presented in [Appendix F](#). Two areas of historically mapped eelgrass beds were identified in the project area, which include:

1. East End Beach (Barge Landing). This is the commercial barge landing for the City of Portland and services the islands of Casco Bay. Access to this landing is currently restricted at low tide requiring dredging.
2. Spring Point Marina. The dredge areas here are associated with maintaining water depths for the Spring Point Marina and associated access channel. Since this survey was conducted, SMCC has elected to not participate in the dredge permit application.

Eelgrass was observed at both the East End Beach and Spring Point Marina. Based on the survey the proposed dredge area at the East End Beach includes approximately 3% of the MEDEP 2018 mapped eelgrass bed. The proposed dredge area at the Spring Point Marina includes approximately 2% of the 2018 MEDEP mapped bed.

4.2 Lobster Survey

Stantec conducted the lobster survey in December 2017. A detailed lobster survey report is presented in [Appendix F](#). Based on the MDMR's review of the project dredge areas the Ocean Gateway Marine Terminal (Ocean Gateway) dredge area was the only area identified as having sufficient water depth to support lobster in the winter months. The MDMR requested surveys at locations within the Ocean Gateway dredge area as presented in [Figure 2 of Appendix F](#). This is the commercial cruise ship landing for the City of Portland. The proposed dredge depth is 38 feet below MLLW. This dredge area is located just east of the deeper water associated with the former Bath Iron Works sinking basin.

Stantec completed the lobster survey in December 2017. No lobsters were observed during the December survey at the Ocean Gateway dredge area. Close inspections of observed burrows were made during the dive surveys, but only two Jonah Crabs (*Cancer borealis*) were observed. As presented in [Table 1 of Appendix F](#), numerous burrows were observed in the substrate. Many of these may be from lobster, but others could be from Jonah or rock crab (*Cancer irroratus*). The substrate in the eastern transect was primarily a sandy silt; further west, the substrate was interspersed with exposed marine clay. Burrows in the marine clay are likely to persist for many years based on the cohesions of this sediment type. The only marine taxa observed during the dive survey were the Jonah crab and burrowing anemones.

5.0 CULTURAL AND HISTORIC RESOURCES ASSESSMENT

In compliance with the Section 106 of the National Historic Preservation Act, letters requesting significant cultural or historic resources associated with the dredge area locations in Portland and South Portland were delivered to the following organizations:

- Houlton Band of Maliseet Indians;
- Aroostook Band of Micmacs;
- Passamaquoddy Indian Tribe, Indian Township Reservation;
- Passamaquoddy Indian Tribe, Pleasant Point Reservation; and
- Penobscot Nation Cultural Land Historic Preservation Department.

The responses from each of these stakeholders is presented in [Appendix G](#).

In summary, the Maine Historic Preservation Commission responded stating that “there will be no historic properties affected by the proposed undertaking as defined by Section 106 of the National Historic Preservation Act. Additionally, the Native American tribes do not have concerns regarding cultural and historic resources but do request that if human remains, archaeological properties, or other items of historical importance be unearthed during dredging activities that dredging be stopped and the appropriate authorities, including the Tribes, be notified prior to commencement of dredging.

6.0 DREDGE PRISM AND DREDGE VOLUMES

Dredge prisms identify the area requiring dredging and the depth of water in that area at MLLW. Combining this information with the current bathymetry survey data, a dredge volume can be calculated for each dredge prism.

Each wharf and waterfront property owner was interviewed to determine the dredge area(s) associated with their properties and the target water depth for each individual dredge area. Figures showing this information are presented in [Appendix B](#). Based on this information combined with the latest bathymetry data dredge volumes for each wharf were calculated and are presented in [Appendix H](#).

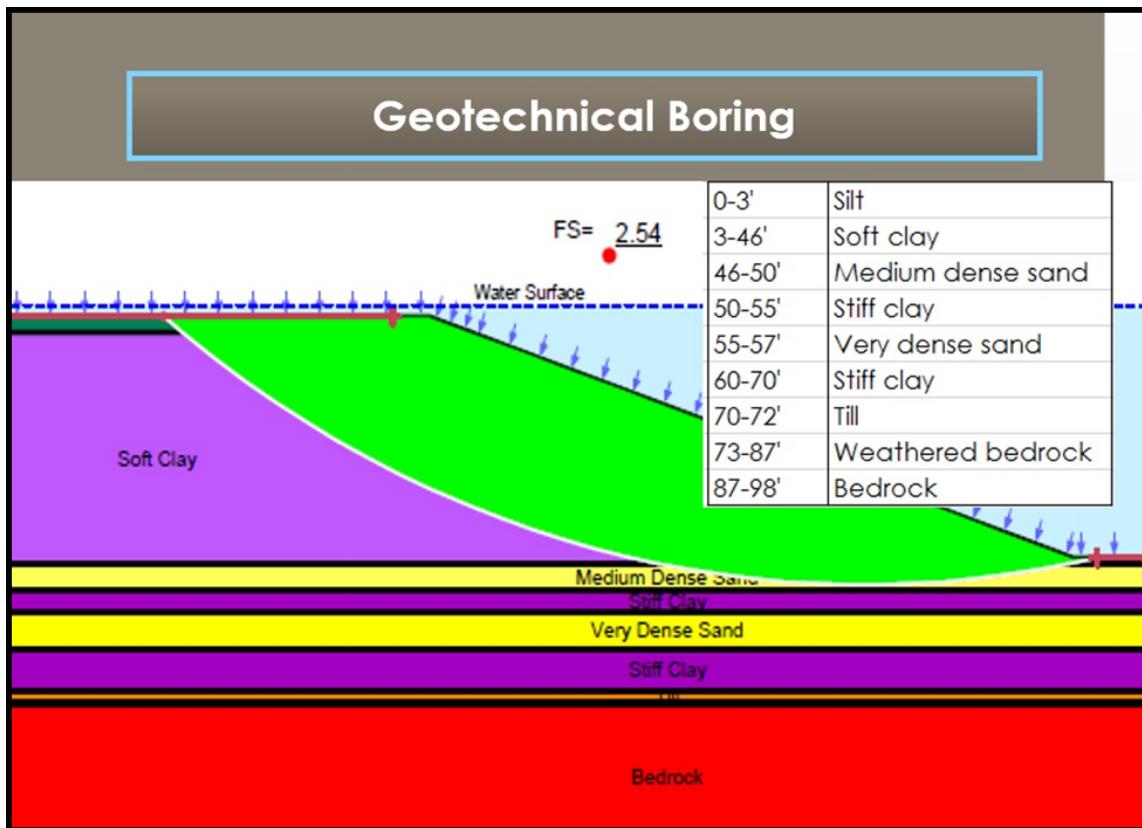
The total project proposed dredge volume is 245,614 cubic yards.

7.0 EVALUATION AND PRESENTATION OF RESULTS

The following subsections summarize the analytical results and Project Area conditions.

7.1 Geologic Setting

The following geological summary of the subsurface in Portland Harbor was derived in May 2017 from the marine geotechnical boring activities conducted to support the design of the CAD cell. The cross section runs perpendicular from the South Portland shore through the CAD footprint and ends at the Portland Harbor navigation channel. The CAD cell boring was conducted on the South Portland side of the Harbor and is believed to be also representative of many areas on the Portland side of Portland Harbor. The CAD cell geological boring log information is presented in the geologic cross section presented below. In this boring, a relatively thick layer of clay, the Presumpscot Formation, is evident just below the upper silt layer.



7.2 Data Quality Assessment Summary

Data Quality Objectives (DQOs) are qualitative and quantitative statements that specify the quality and quantity of data needed to support decisions during site assessments. DQOs are developed by considering the purpose for collecting the data and the intended use of the data. The data collected will be used to document the chemical characteristics of the dredge spoils proposed to be placed in the CAD cell and will be reviewed against the USACE RIM requirements and the MEDEP September 9, 2018 RAGs for DQO purposes only.

A data quality assessment review of the data was conducted by Stantec. The results of the review are presented in [Appendix I](#).

7.3 Analytical Data

The composite sediment samples were analyzed by Alpha following the USACE RIM bulk chemistry requirements. The following is a summary of the analytical analyses conducted:

- Semi-volatile Organic Compounds (SVOCs) – USEPA Method 8270C SIM
- Metals – USEPA Method SW846 – 6000/7000 Series

- Pesticides – EPA Method 8081B
- Polychlorinated Biphenyls (PCBs) – EPA Method SW8082

Analytical results evaluated based on a comparison to the Soil Construction Worker exposure scenario in MEDEP's RAGs for Sites Contaminated with Hazardous Substances dated October 19, 2018. This comparison will be used for the purpose of identifying potential exposure risks for dredge construction workers and for preparing health and safety plans for proposed sediment dredging activities in Portland Harbor.

7.4 Sediment Sample Results

The CEG team collected two vibracore samples per wharf/waterfront area for a total of 30 individual sediment samples, as outlined in [Table 2](#) and presented in the Sample Location Figures in [Appendix B](#). Analytical result tables and analytical laboratory results for project sediment samples are presented in [Appendix J](#).

Two composite sediment samples were collected at Turner's Island.

PAH Compounds

PAHs were detected in every sample collected. Benzo(A)pyrene was detected at two sample locations exceeding the Construction Worker RAG of 9,900 micrograms per kilogram ($\mu\text{g}/\text{kg}$). A benzo(A)pyrene concentration of 10,400 $\mu\text{g}/\text{kg}$ was detected at CSP-7 (Union Wharf) and a concentration of 88,600 $\mu\text{g}/\text{kg}$ was detected at CSP-8 (Wright Wharf).

Metals

Metals were detected in every sample collected. Lead was detected in three sediment samples (CSP-4, 7, and 9) exceeding the Construction Worker RAG of 450 milligrams per kilograms (mg/kg) and mercury was detected in two sediment samples (CSP-7 and 9) exceeding the Construction Worker RAG of 3.1 mg/kg as summarized:

- CSP-4 (Portland Pier) exceeded the lead RAG with a concentration of 1,430 mg/kg ;
- CSP-7 (Union Wharf) exceeded both lead and mercury RAGs with respective concentrations of 780 mg/kg and 4.16 mg/kg ; and
- CSP-9 (Holyoke Wharf) exceeded both lead and mercury RAGs with respective concentrations of 546 mg/kg and 7.82 mg/kg .

Polychlorinated Biphenyls

PCBs were detected in every sample. No PCBs were detected in project sediment samples at a concentration exceeding the Construction Worker RAGs,

Pesticides

Pesticides were detected in every sample. No pesticides were detected in project sediment samples at a concentration exceeding Construction Worker RAGs.

Grain Size

Grain size analysis results are presented in [Appendix J](#).

The results of this sampling will be taken into consideration when determining the level of health and safety protection for dredge workers during dredging activities. Grain size and Atterberg limit data will be used to support design activities.

8.0 ADDITIONAL WORK

Additional work to be finalized in 2019 to further develop the design and permitting strategy, includes the following:

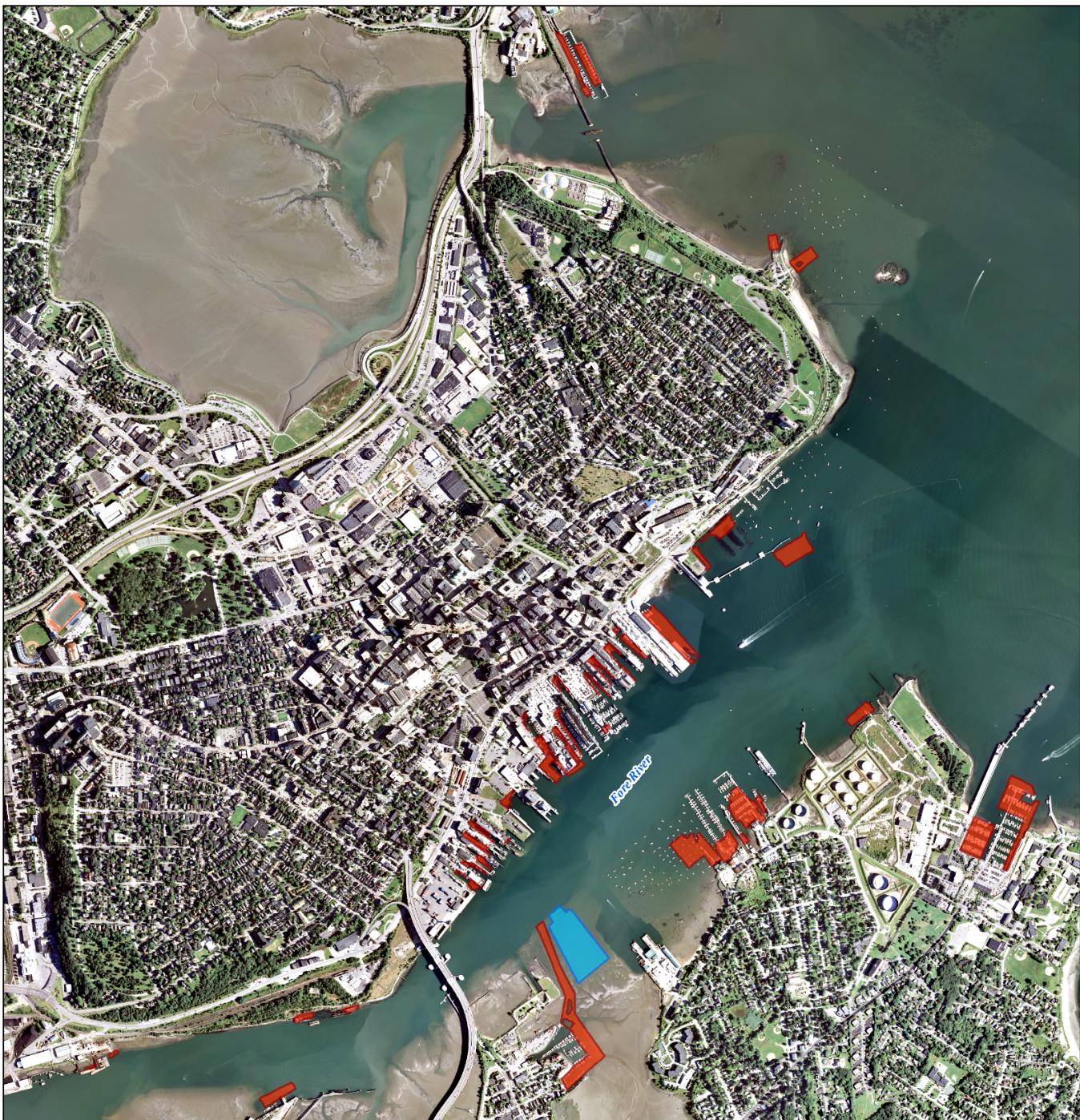
- Finalize draft dredge figures and plan view and cross-sections being developed for 30% design; and
- Complete permit application, technical reports and alternatives analysis.

This project must obtain permits from local, state, and federal agencies. The CEG Team has held multiple regulatory meetings with the cities of Portland and South Portland, MEDEP, and USACE to discuss the most expeditious permitting path for these unique and complex projects. For the Dredge Project, the agencies have recommended an umbrella permit with the Portland Harbor Commission as the applicant that covers all the individual pier and marina owners. The CAD Cell will have a separate permit with the City of Portland as the applicant. The CEG Team is working to synchronize the applications so that the CAD Cell will be permitted at the same time as the Dredge Project. The CEG Team is working to obtain permitted projects by spring 2020.

This Brownfields Grant closed in September 2019. To complete the future work identified above, additional funding has been procured through the Maine State Brownfields Program and the City of Portland, Maine, Tax Increment Financing budget.

Appendix A

Proposed Dredge Areas



Legend

- Proposed Dredge Footprint
- Proposed CAD Cell Footprint

0 2,000
(At original document size of 8.5x11)
1:24,000



 Stantec

Project Location
Portland, Maine

Prepared by KWH on 2019-04-25
TR by MPJ on 2019-04-26

Client/Project
Portland Harbor Commission
Portland Harbor Dredge Project

19560 1684

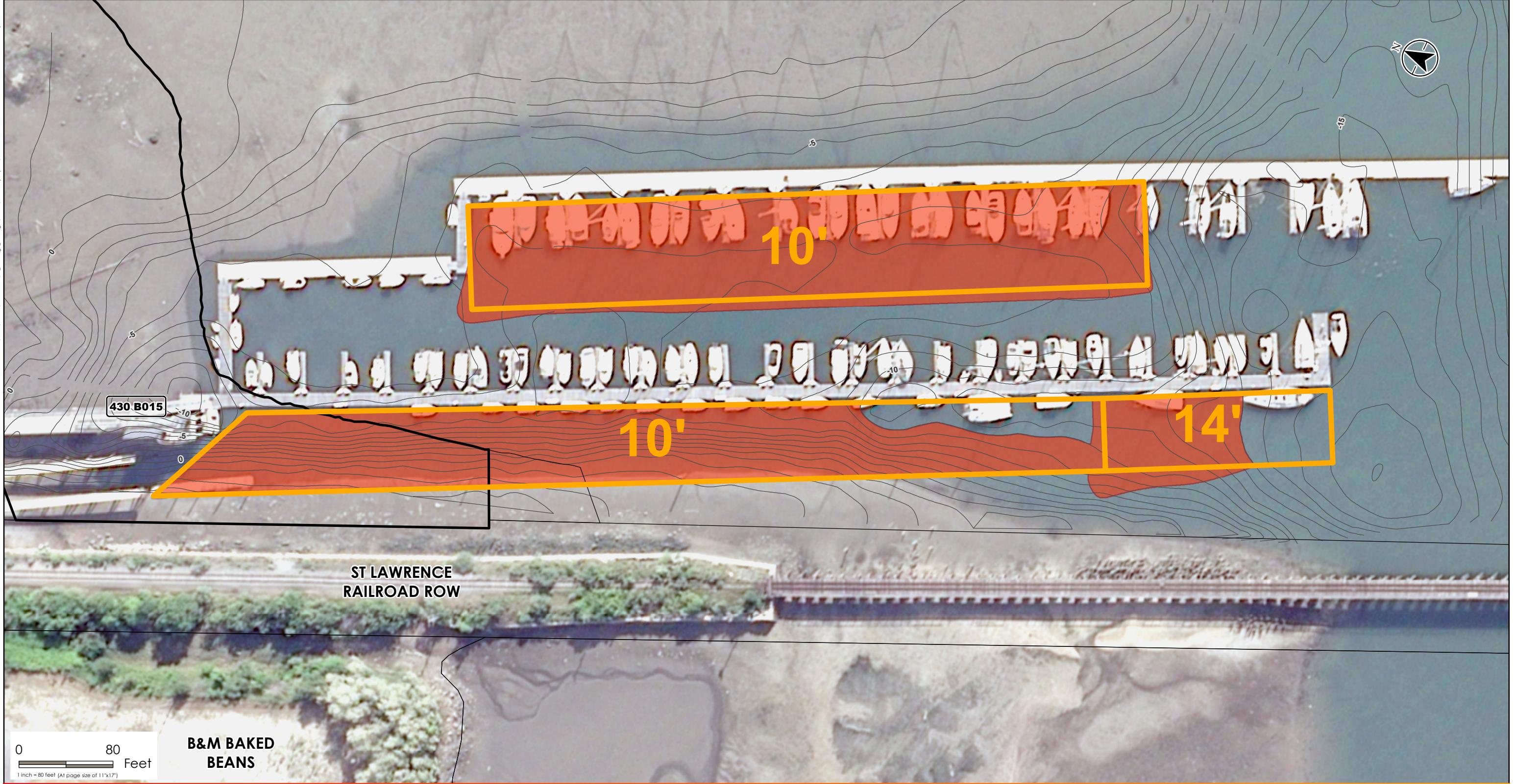
Figure No.

DRAFT

Title
Harbor Overview

Appendix B

Sample Location and Historical Industry Location Figures



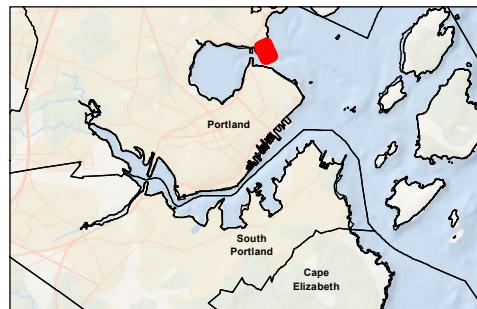
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195601199



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01-MaineYachtCenter.mxd

**Legend**

- Stormwater Outfall
- 1' Bathymetric Contour
- Wharf Owner Tax Parcel and Map/Lot
- Tax Parcel
- - - Approximate Submerged Lands Regulatory Limit

- Dredge Limit and Target Depth
- Estimated Dredge Area
- Vibracore Sample Location

Notes:

1. Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet
2. Bathymetric contours provided by Maine Yacht Center survey date unknown
3. Hydrographic survey datum is referenced to Mean Lower Low Water (MLLW) 1983-2001 tidal epoch. The correction from NAVD88 to MLLW is 5.25 feet for Casco Bay.
4. Elevation assumptions were made to the existing bathymetric surfaces where elevation data was missing to complete proposed dredge footprints. Results in those areas is approximate.
5. An additional 1' overdredge has been applied to each proposed dredge area.
6. 2018 coastal Casco Bay aerial orthophotos provided by the State of Maine, Maine Office of GIS and Maine GeoLibrary Board.

Client/Project
Portland Harbor Commission
Bulk Chemistry Dredge
Sediment Sampling
Figure No.

Maine Yacht Center, LLC
Proposed Dredge
11/8/2019

Owner	Pier/Area	Map_Book_Lot	Estimated Dredge Volume (c.y.)
Maine Yacht Services, LLC	Maine Yacht Service	430 B015	16,035



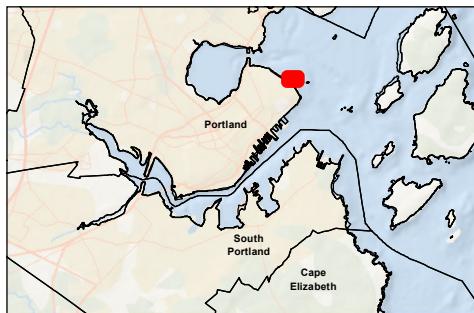
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02-EastEndBeach.mxd

**Legend**

- Stormwater Outfall
- 1' Bathymetric Contour
- Wharf Owner Tax Parcel and Map/Lot
- Tax Parcel
- - - Approximate Submerged Lands Regulatory Limit

- Dredge Limit and Target Depth
- Estimated Dredge Area
- Vibracore Sample Location

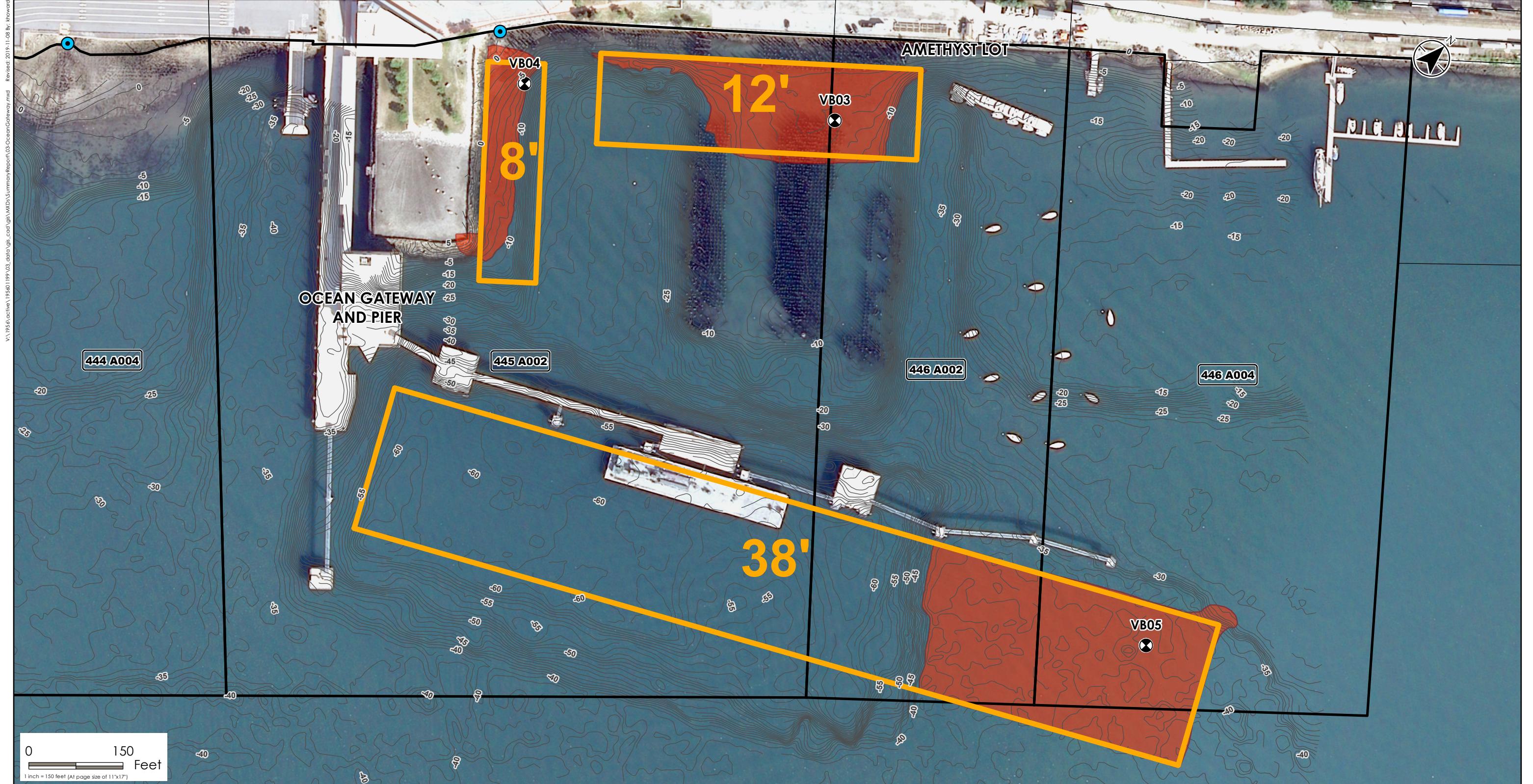
Notes:

1. Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet
2. Hydrographic bathymetric survey performed by Apex Companies, LLC. between November 29, 2016 through December 1, 2016.
3. Hydrographic survey datum is referenced to Mean Lower Low Water (MLLW) 1983-2001 tidal epoch. The correction from NAVD88 to MLLW is 5.25 feet for Casco Bay.
4. Elevation assumptions were made to the existing bathymetric surfaces where elevation data was missing to complete proposed dredge footprints. Results in those areas is approximate.
5. An additional 1' overdredge has been applied to each proposed dredge area.
6. 2018 coastal Casco Bay aerial orthophotos provided by the State of Maine, Maine Office of GIS and Maine GeoLibrary Board.

Client/Project
Portland Harbor Commission
Bulk Chemistry Dredge
Sediment Sampling
Figure No.

Title
East End Beach Proposed Dredge
11/8/2019

Owner	Pier/Area	Map_Book_Lot	Estimated Dredge Volume (c.y.)
City of Portland	East End Public Launch	004 C002, 001 X002	7,059



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03-OceanGateway.mxd



Legend

- Stormwater Outfall
- 1' Bathymetric Contour
- Wharf Owner Tax Parcel and Map/Lot
- Tax Parcel

— Approximate Submerged Lands Regulatory Limit

□ Dredge Limit and Target Depth

■ Estimated Dredge Area

● Vibracore Sample Location

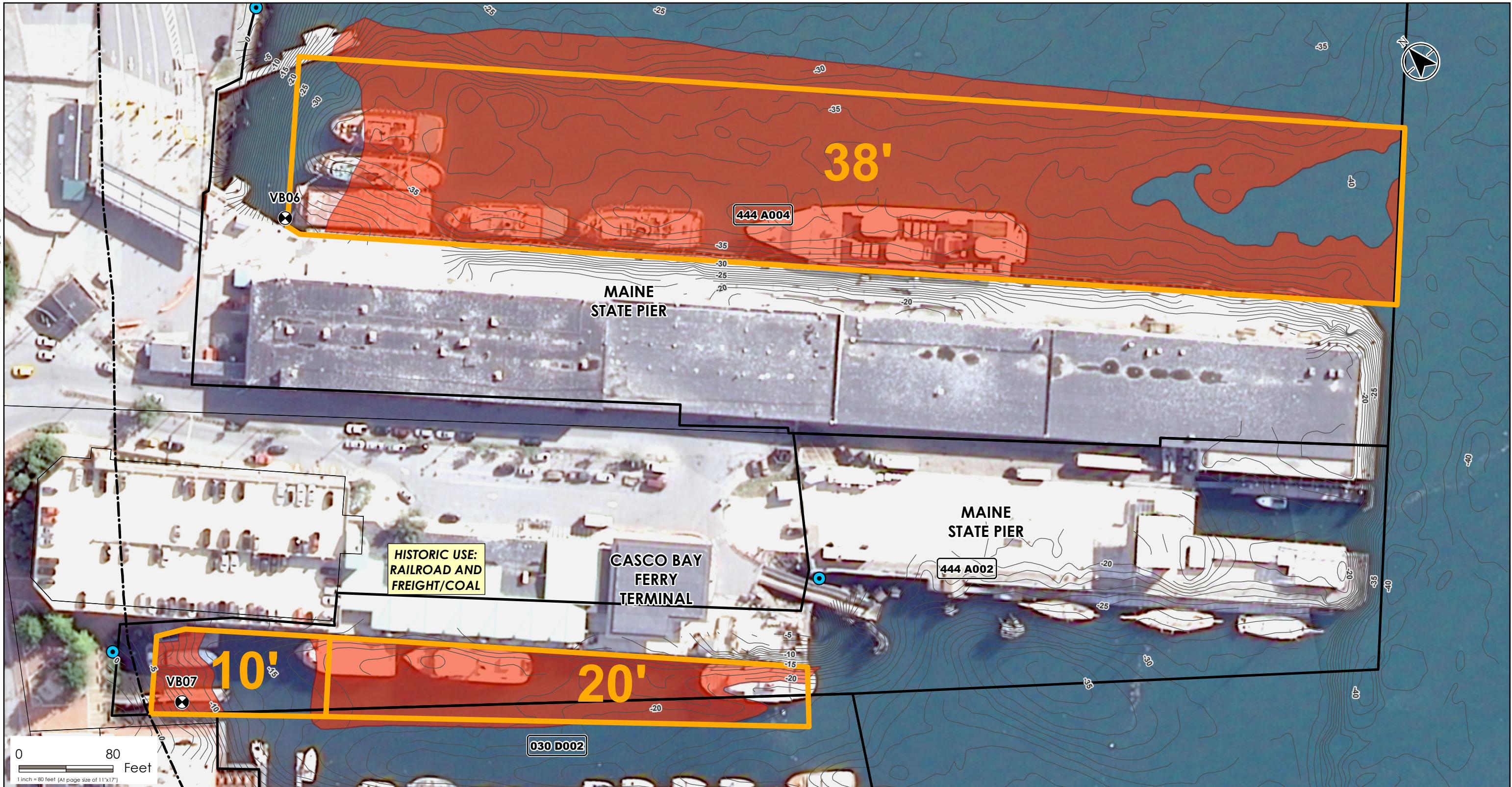
Notes:

- Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet
- Hydrographic bathymetric survey performed by Apex Companies, LLC. between November 29, 2016 through December 1, 2016.
- Hydrographic survey datum is referenced to Mean Lower Low Water (MLLW) 1983-2001 tidal epoch. The correction from NAVD88 to MLLW is 5.25 feet for Casco Bay.
- Elevation assumptions were made to the existing bathymetric surfaces where elevation data was missing to complete proposed dredge footprints. Results in those areas is approximate.
- An additional 1' overdepth has been applied to each proposed dredge area.
- 2018 coastal Casco Bay aerial orthophotos provided by the State of Maine, Maine Office of GIS and Maine GeoLibrary Board.

Client/Project
Portland Harbor Commission
Bulk Chemistry Dredge
Sediment Sampling
Figure No.

Title
Amethyst Lot/Ocean Gateway Proposed Dredge
11/8/2019

Owner	Pier/Area	Map_Book_Lot	Estimated Dredge Volume (c.y.)
City of Portland	Ocean Gateway	445 A002, 446 A002, 446 A004	18,869



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04-MaineStatePier.mxd



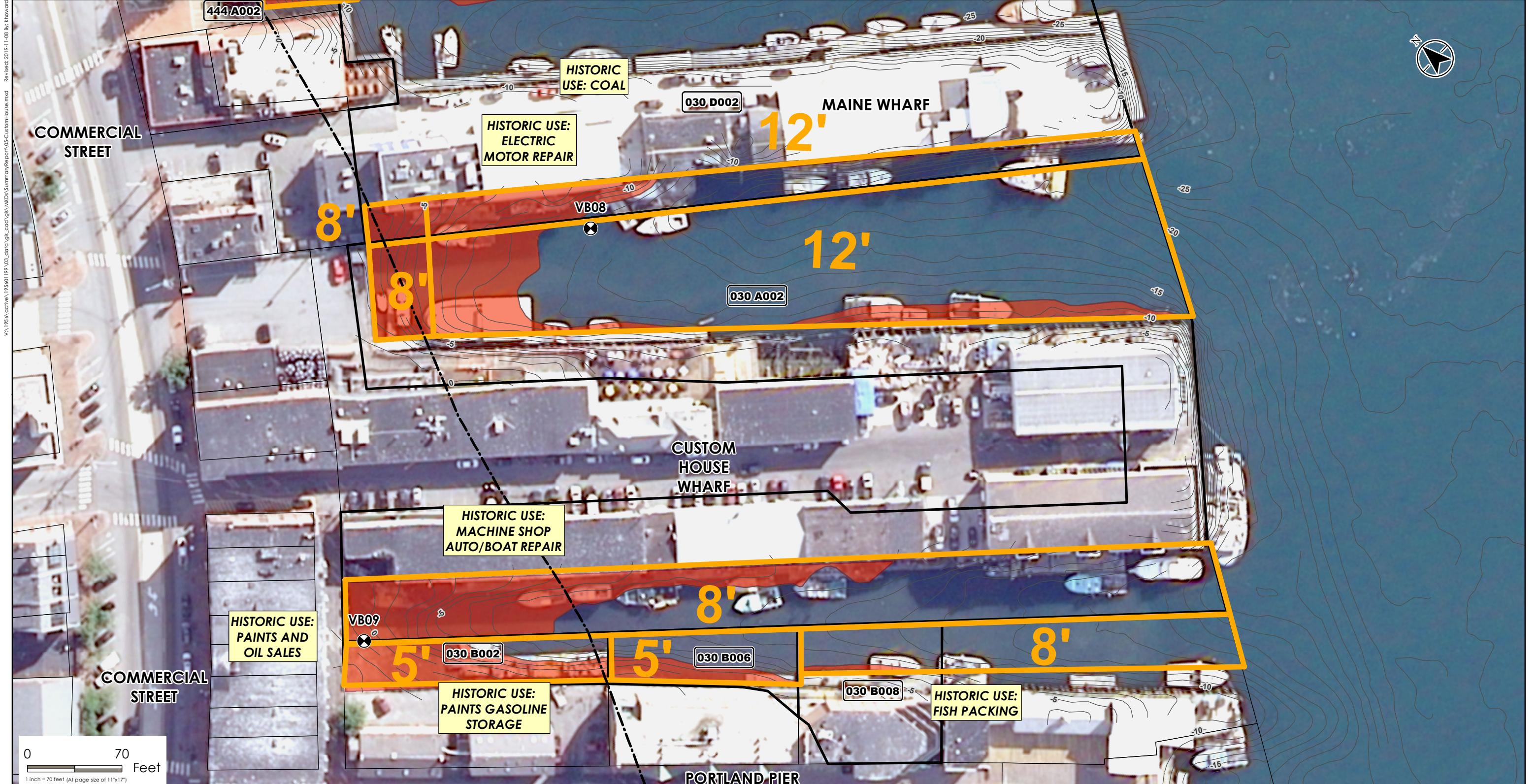
Owner	Pier/Area	Map_Book_Lot	Estimated Dredge Volume (c.y.)
City of Portland	Maine State Pier	444 A004, 002	20,305

Notes:

- Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet
- Hydrographic bathymetric survey performed by Apex Companies, LLC. between November 29, 2016 through December 1, 2016.
- Hydrographic survey datum is referenced to Mean Lower Low Water (MLLW) 1983-2001 tidal epoch. The correction from NAVD88 to MLLW is 5.25 feet for Casco Bay.
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- An additional 1' overdredge has been applied to each proposed dredge area.
- 2018 coastal Casco Bay aerial orthophotos provided by the State of Maine, Maine Office of GIS and Maine GeoLibrary Board.

Client/Project
Portland Harbor Commission
Bulk Chemistry Dredge
Sediment Sampling
Figure No.

Title
Maine State Pier Proposed Dredge
11/8/2019

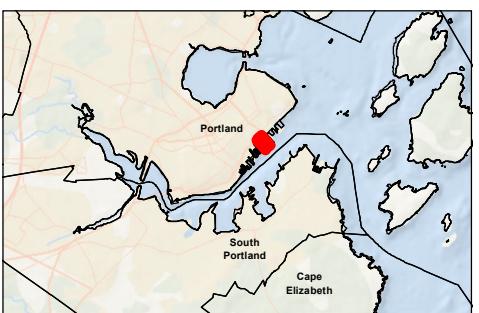


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05-CustomHouse.mxd



Legend

- Stormwater Outfall
- 1' Bathymetric Contour
- Wharf Owner Tax Parcel and Map/Lot
- Tax Parcel

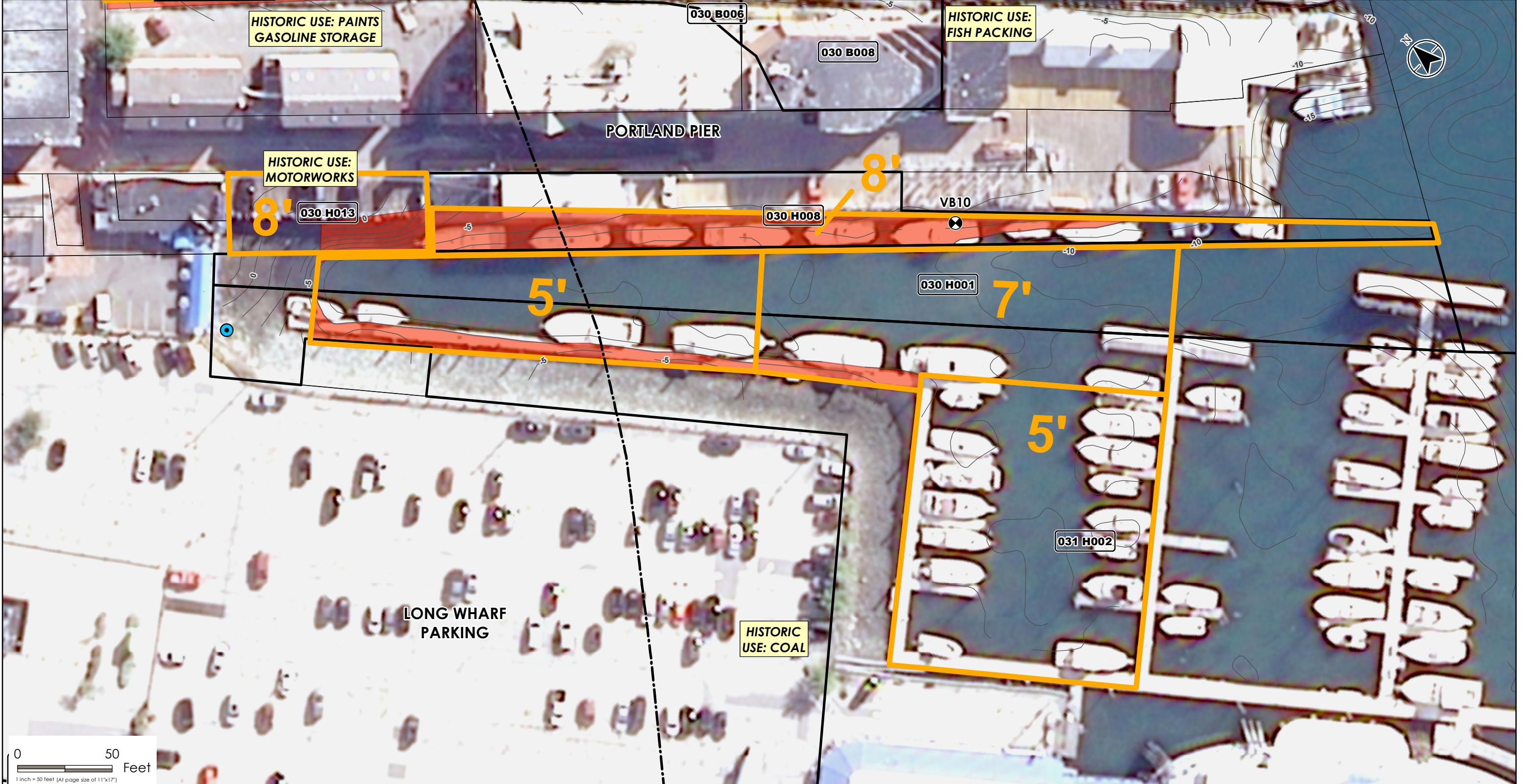
Owner	Pier/Area	Map Book, Lot	Estimated Dredge Volume (c.y.)
Maine Wharf, LLC	Maine Wharf Assumed Dredge Areas	030 D002	873
Proprietors of Custom House Wharf	Custom House Wharf	030 A002	3,012
Barbara Kriger	Portland Pier	030 B002	980
40 Portland Pier Condo Association	Portland Pier	030 B006	163
Atlantic Refinace, LLC	Portland Pier	030 B008	31

Notes:

- Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet
- Hydrographic bathymetric survey performed by Apex Companies, LLC between November 29, 2016 through December 1, 2016.
- Hydrographic survey datum is referenced to Mean Lower Low Water (MLLW) 1983-2001 tidal epoch. The correction from NAVD88 to MLLW is 5.25 feet for Casco Bay.
- Elevation assumptions were made to the existing bathymetric surfaces where elevation data was missing to complete proposed dredge footprints. Results in those areas is approximate.
- An additional 1' overdredge has been applied to each proposed dredge area.
- 2018 coastal Casco Bay aerial orthophotos provided by the State of Maine, Maine Office of GIS and Maine GeoLibrary Board.

Client/Project
Portland Harbor Commission
Bulk Chemistry Dredge
Sediment Sampling
Figure No.

Title
Maine/Custom House Wharf
Portland Pier (N) Proposed Dredge
11/8/2019

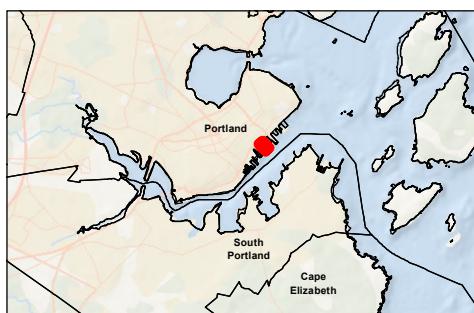


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06-PortlandPier.mxd



Legend

- Stormwater Outfall
- 1' Bathymetric Contour
- Wharf Owner Tax Parcel and Map/Lot
- Tax Parcel

Owner	Pier/Area	Map_Book_Lot	Estimated Dredge Volume (c.y.)
Barbara Kriger	Portland Pier	030 H013	209
39 Portland Pier, Inc.	Portland Pier	030 H008	446
Dimillo Arlene Et Al Trustees	Long Wharf/Dimillos	030 H001, 031 H002	191

Notes:

- Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet
- Hydrographic bathymetric survey performed by Apex Companies, LLC between November 29, 2016 through December 1, 2016.
- Hydrographic survey datum is referenced to Mean Lower Low Water (MLLW) 1983-2001 tidal epoch. The correction from NAVD88 to MLLW is 5.25 feet for Casco Bay.
- Elevation assumptions were made to the existing bathymetric surfaces where elevation data was missing to complete proposed dredge footprints. Results in those areas is approximate.
- An additional 1' overdepth has been applied to each proposed dredge area.
- 2018 coastal Casco Bay aerial orthophotos provided by the State of Maine, Maine Office of GIS and Maine GeoLibrary Board.

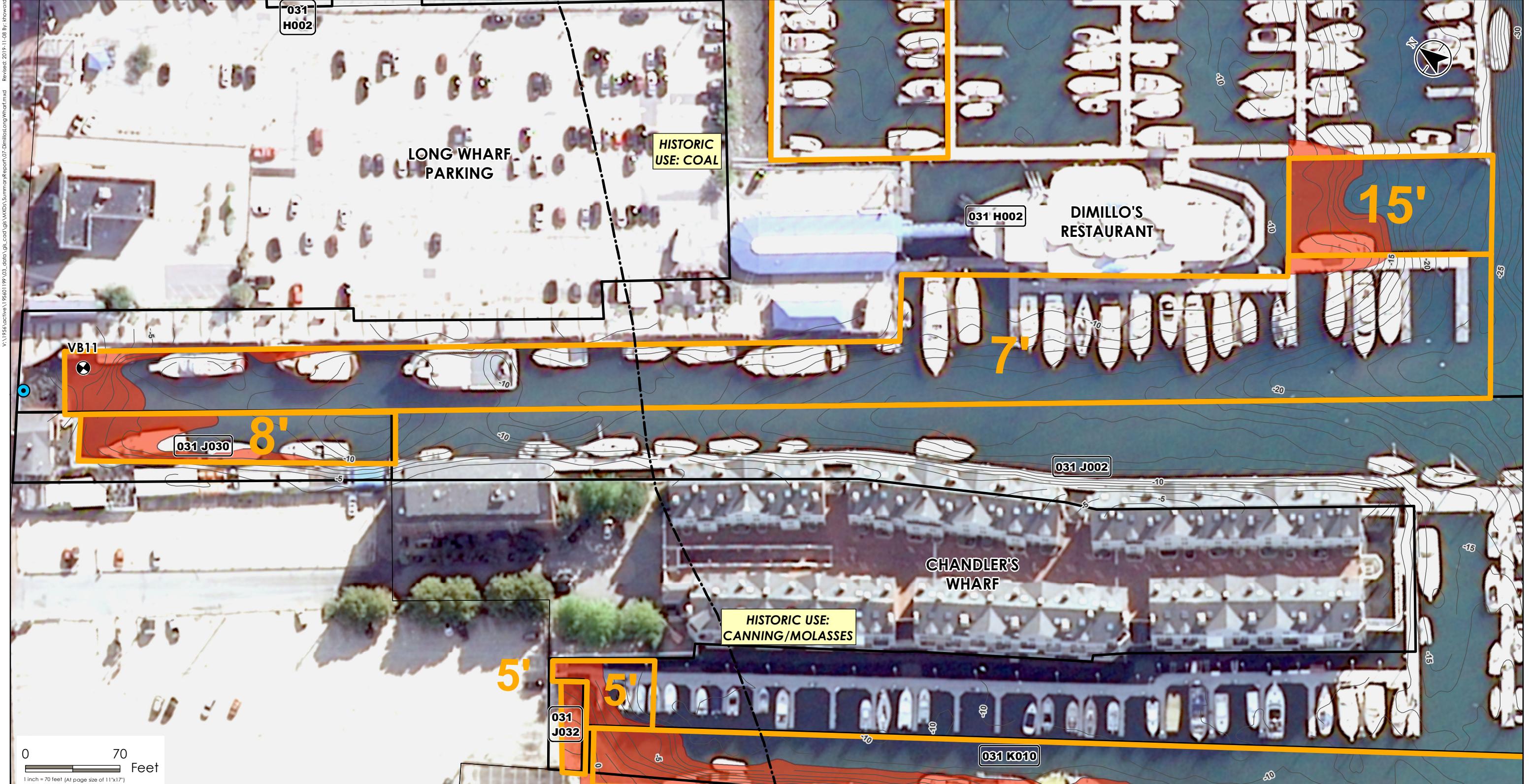
Client/Project

Portland Harbor Commission
Bulk Chemistry Dredge
Sediment Sampling
Figure No.

Title

Portland Pier (\$)/Long Wharf Proposed Dredge

11/8/2019



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07-DimillosLongWharf.mxd



Legend

- Stormwater Outfall
- 1' Bathymetric Contour
- Wharf Owner Tax Parcel and Map/Lot
- Tax Parcel

--- Approximate Submerged Lands Regulatory Limit

□ Dredge Limit and Target Depth

■ Estimated Dredge Area

● Vibracore Sample Location

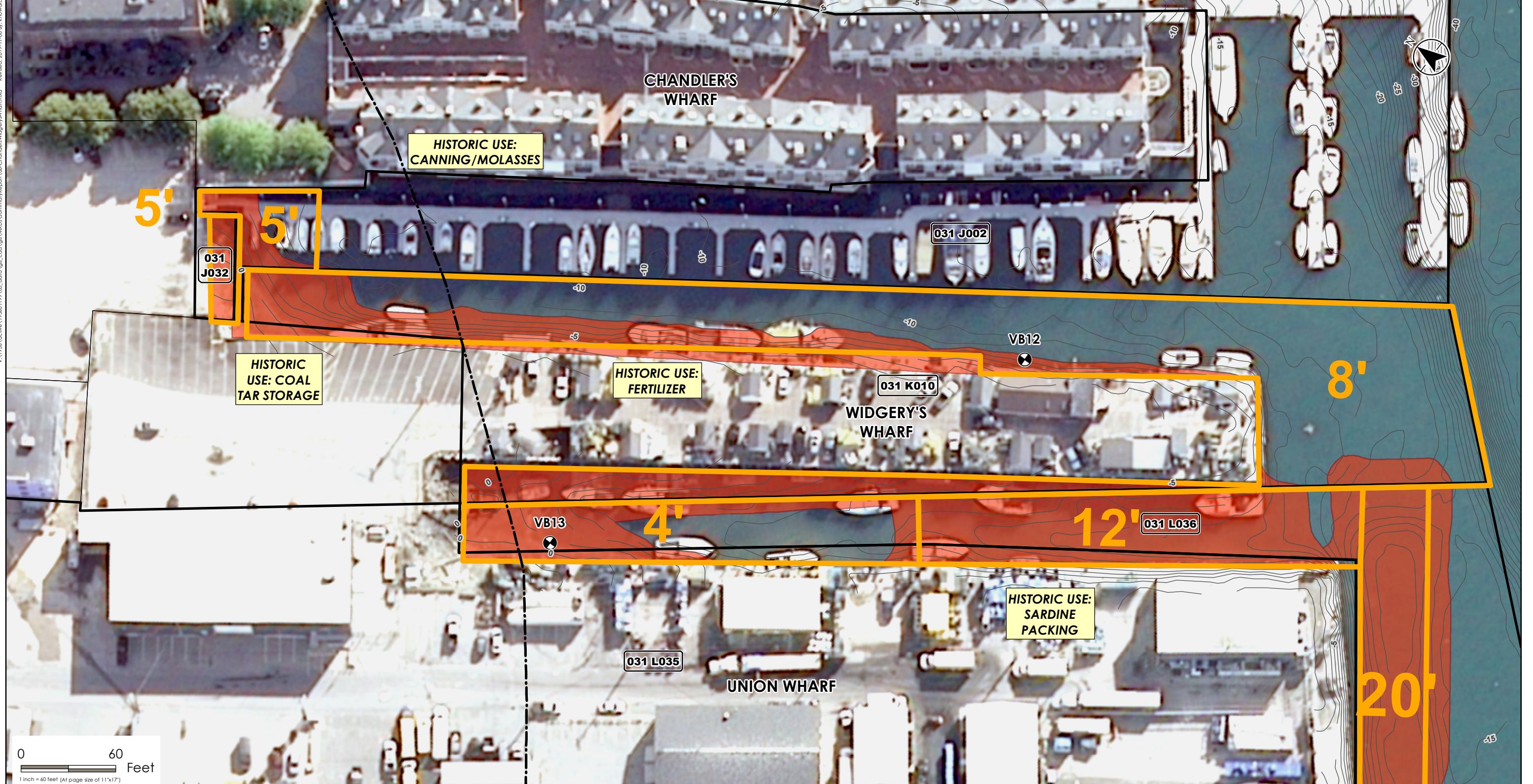
Notes:

1. Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet
2. Hydrographic bathymetric survey performed by Apex Companies, LLC. between November 29, 2016 through December 1, 2016.
3. Hydrographic survey datum is referenced to Mean Lower Low Water (MLLW) 1983-2001 tidal epoch. The correction from NAVD88 to MLLW is 5.25 feet for Casco Bay.
4. Elevation assumptions were made to the existing bathymetric surfaces where elevation data was missing to complete proposed dredge footprints. Results in those areas is approximate.
5. An additional 1' overdredge has been applied to each proposed dredge area.
6. 2018 coastal Casco Bay aerial orthophotos provided by the State of Maine, Maine Office of GIS and Maine GeoLibrary Board.

Client/Project
Portland Harbor Commission
Bulk Chemistry Dredge
Sediment Sampling
Figure No.

Title
Dimillo's/Long and Chandler's Wharf (N) Proposed Dredge
11/8/2019

Owner	Pier/Area	Map_Book_Lot	Estimated Dredge Volume (c.y.)
Dimillo Arlene Et Al Trustees	Long Wharf/Dimillos	030 H001, 031 002	1,131
Stephen and Linda Dumont JTS	Chandler's Wharf	031 J002	111
GEF LLC	Chandler's Wharf	031 J030, 031 J032	592



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08-ChandlersWidgeryWharf.mxd



Legend

- Stormwater Outfall
- 1' Bathymetric Contour
- Wharf Owner Tax Parcel and Map/Lot
- Tax Parcel

- Approximate Submerged Lands Regulatory Limit
- Dredge Limit and Target Depth
- Estimated Dredge Area
- Vibracore Sample Location

Notes:

1. Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet
2. Hydrographic bathymetric survey performed by Apex Companies, LLC between November 29, 2016 through December 1, 2016.
3. Hydrographic survey datum is referenced to Mean Lower Low Water (MLLW) 1983-2001 tidal epoch. The correction from NAVD88 to MLLW is 5.25 feet for Casco Bay.
4. Elevation assumptions were made to the existing bathymetric surfaces where elevation data was missing to complete proposed dredge footprints. Results in those areas is approximate.
5. An additional 1' overdredge has been applied to each proposed dredge area.
6. 2018 coastal Casco Bay aerial orthophotos provided by the State of Maine, Maine Office of GIS and Maine GeoLibrary Board.

Client/Project

Portland Harbor Commission
Bulk Chemistry Dredge
Sediment Sampling

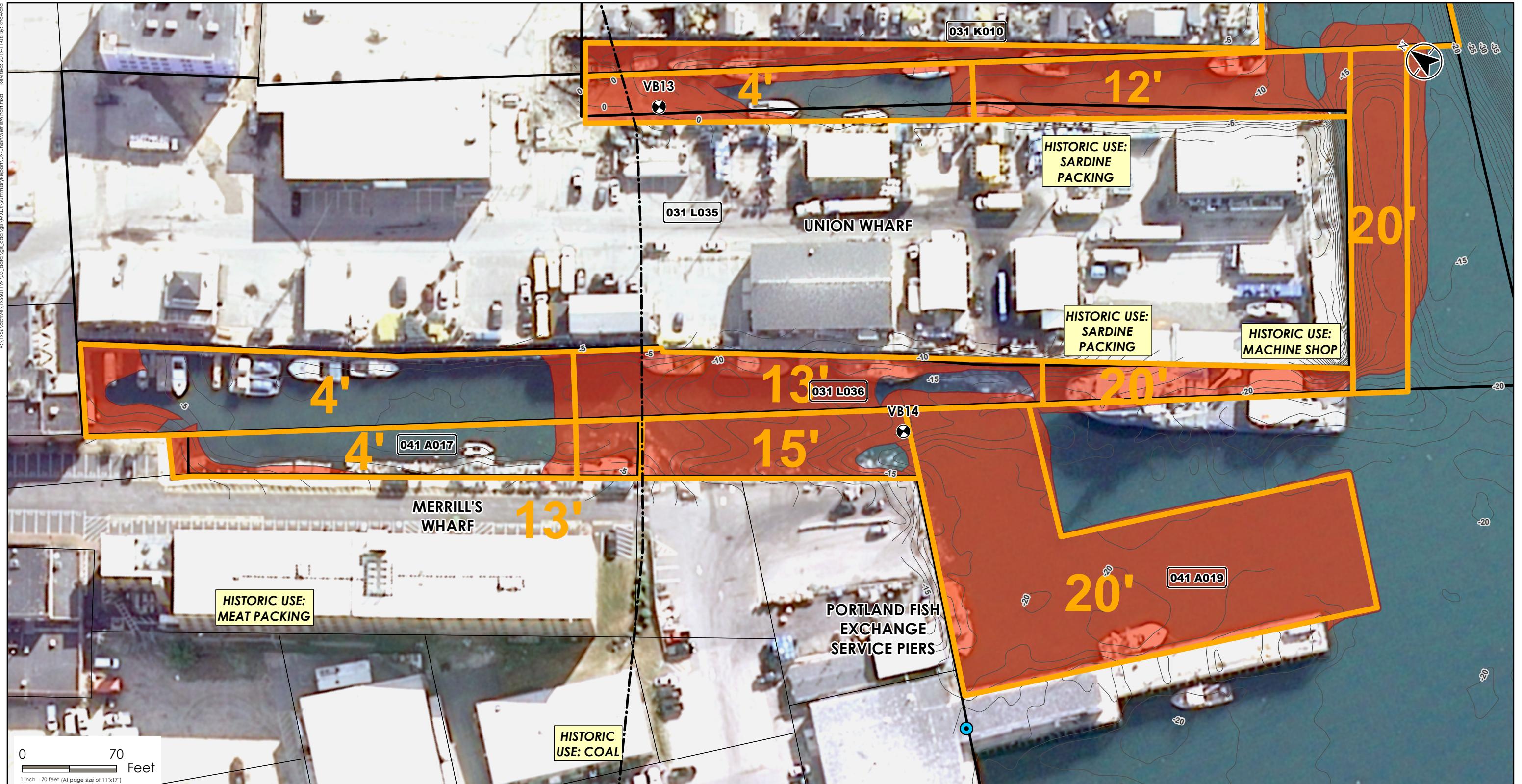
Figure No.

Title

Chandler's Wharf (S)/Widgery's Wharf and Union Wharf (N) Proposed Dredge

11/8/2019

Owner	Pier/Area	Map_Book_Lot	Estimated Dredge Volume (c.y.)
Widgery Wharf, Inc.	Widgery's Wharf	031 K010	3,887
Proprietors of Union Wharf	Union Wharf (N)	031 L035/031 L036	3,130



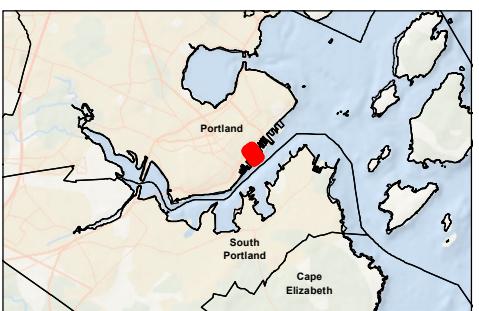
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85601199



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09-UnionMerrillsWharf.mxd



Legend

- Stormwater Outfall
 - 1' Bathymetric Contour
 - Wharf Owner Tax Parcel and Map/Lot
 - Tax Parcel

- Approximate Submerged Lands Regulatory Limit
 -  Dredge Limit and Target Depth
 -  Estimated Dredge Area
 -  Vibracore Sample Location

Owner	Pier/Area	Map_Book_Lot	Estimated Dredge Volume (c.y.)
Proprietors of Union Wharf	Union Wharf (S)	031 L035, 031 L036	4,624
City of Portland	Merrill's Wharf	041 A019	5,044
Waterfront Maine	Merrill's Wharf	041 A017	829

Note

- Notes:**

 - 1. Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet
 - 2. Hydrographic bathymetric survey performed by Apex Companies, LLC. between November 29, 2016 through December 1, 2016.
 - 3. Hydrographic survey datum is referenced to Mean Lower Low Water (MLLW) 1983-2001 tidal epoch. The correction from NAVD88 to MLLW is 5.25 feet for Casco Bay.
 - 4. Elevation assumptions were made to the existing bathymetric surfaces where elevation data was missing to complete proposed dredge footprints. Results in those areas is approximate.
 - 5. An additional 1' overdredge has been applied to each proposed dredge area.
 - 6. 2018 coastal Casco Bay aerial orthophotos provided by the State of Maine, Maine Office of GIS and Maine GeoLibrary Board.

Client/Project

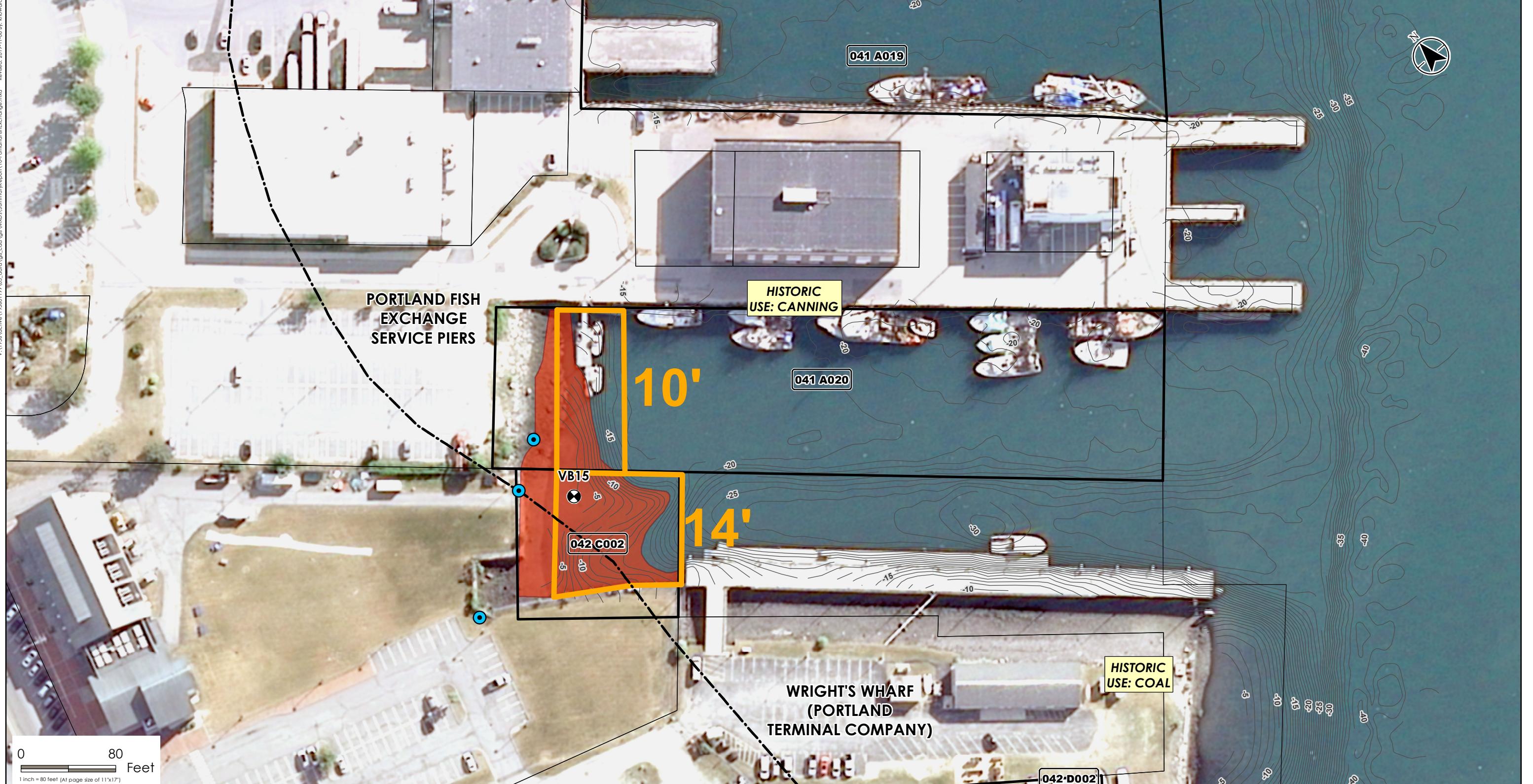
Portland Harbor Commission
Bulk Chemistry Dredge
Sediment Sampling

Figure No

Title

Union Wharf/Merrill's Wharf and Portland Fish Pier Proposed Dredge

11/8/2019



30 Park Drive
Topsham, ME USA 04086
Phone (207) 729-1199

10-PortlandFishExchange.mxd



Legend

- Stormwater Outfall
- 1' Bathymetric Contour
- Wharf Owner Tax Parcel and Map/Lot
- Tax Parcel

— Approximate Submerged Lands Regulatory Limit

■ Dredge Limit and Target Depth

■ Estimated Dredge Area

● Vibracore Sample Location

Notes:

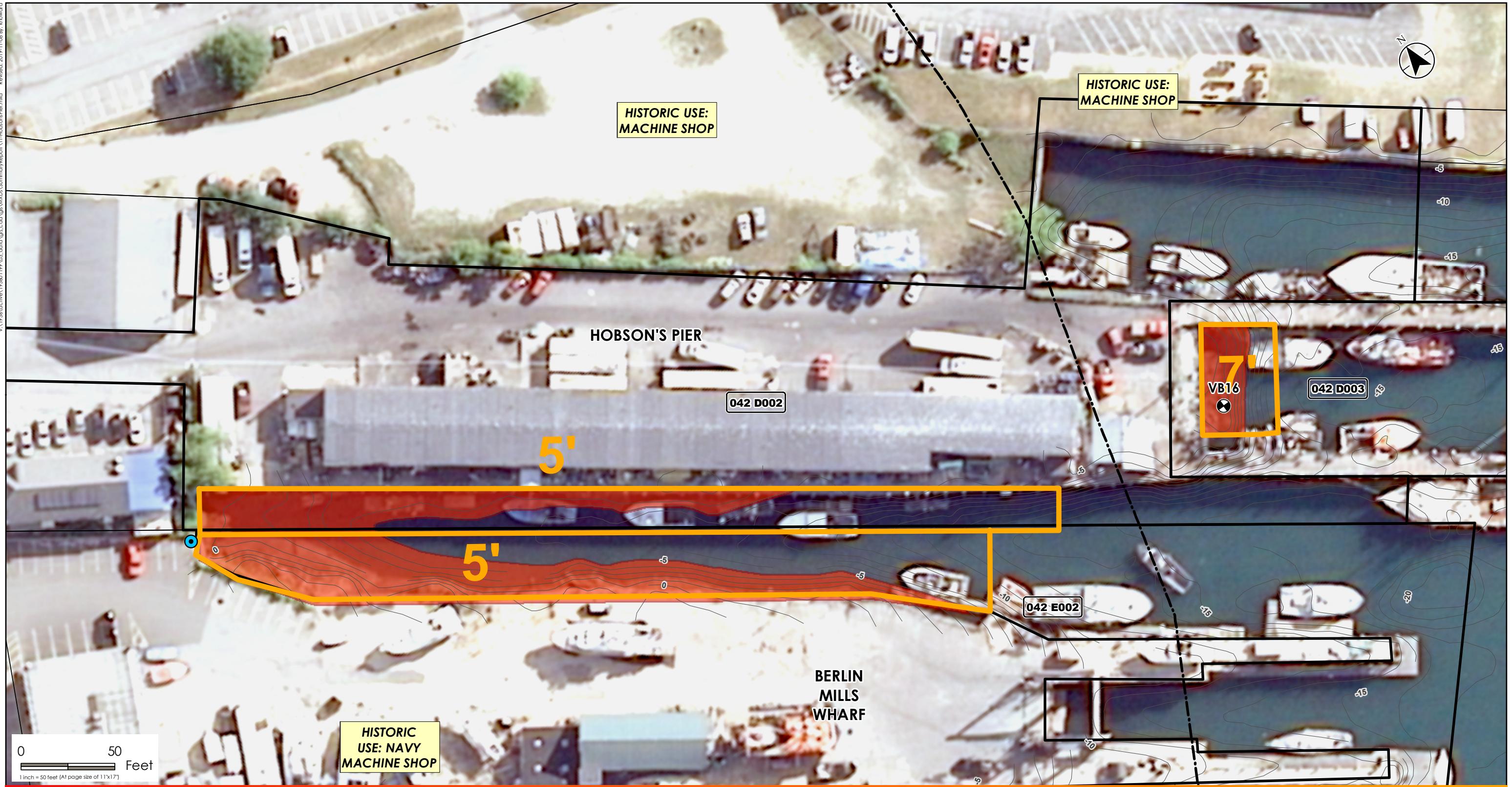
1. Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet
2. Hydrographic bathymetric survey performed by Apex Companies, LLC. between November 29, 2016 through December 1, 2016.
3. Hydrographic survey datum is referenced to Mean Lower Low Water (MLLW) 1983-2001 tidal epoch. The correction from NAVD88 to MLLW is 5.25 feet for Casco Bay.
4. Elevation assumptions were made to the existing bathymetric surfaces where elevation data was missing to complete proposed dredge footprints. Results in those areas is approximate.
5. An additional 1' overdredge has been applied to each proposed dredge area.
6. 2018 coastal Casco Bay aerial orthophotos provided by the State of Maine, Maine Office of GIS and Maine GeoLibrary Board.

Client/Project
Portland Harbor Commission
Bulk Chemistry Dredge
Sediment Sampling
Figure No.

Title
Portland Fish Pier and GMRI Proposed Dredge
11/8/2019

195601199

Owner	Pier/Area	Map_Book_Lot	Estimated Dredge Volume (c.y.)
City of Portland	Portland Fish Pier	041 A020	646
Gulf of Maine Properties, Inc.	GMRI	042 C002	2,781



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195601199



30 Park Drive
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Phone (207) 729-1199

11-HobsonsPier.mxd

**Legend**

- Stormwater Outfall
- 1' Bathymetric Contour
- Wharf Owner Tax Parcel and Map/Lot
- Tax Parcel

--- Approximate Submerged Lands Regulatory Limit

□ Dredge Limit and Target Depth

■ Estimated Dredge Area

● Vibracore Sample Location

Notes:

1. Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet
2. Hydrographic bathymetric survey performed by Apex Companies, LLC. between November 29, 2016 through December 1, 2016.
3. Hydrographic survey datum is referenced to Mean Lower Low Water (MLLW) 1983-2001 tidal epoch. The correction from NAVD88 to MLLW is 5.25 feet for Casco Bay.
4. Elevation assumptions were made to the existing bathymetric surfaces where elevation data was missing to complete proposed dredge footprints. Results in those areas is approximate.
5. An additional 1' overdredge has been applied to each proposed dredge area.
6. 2018 coastal Casco Bay aerial orthophotos provided by the State of Maine, Maine Office of GIS and Maine GeoLibrary Board.

Client/Project

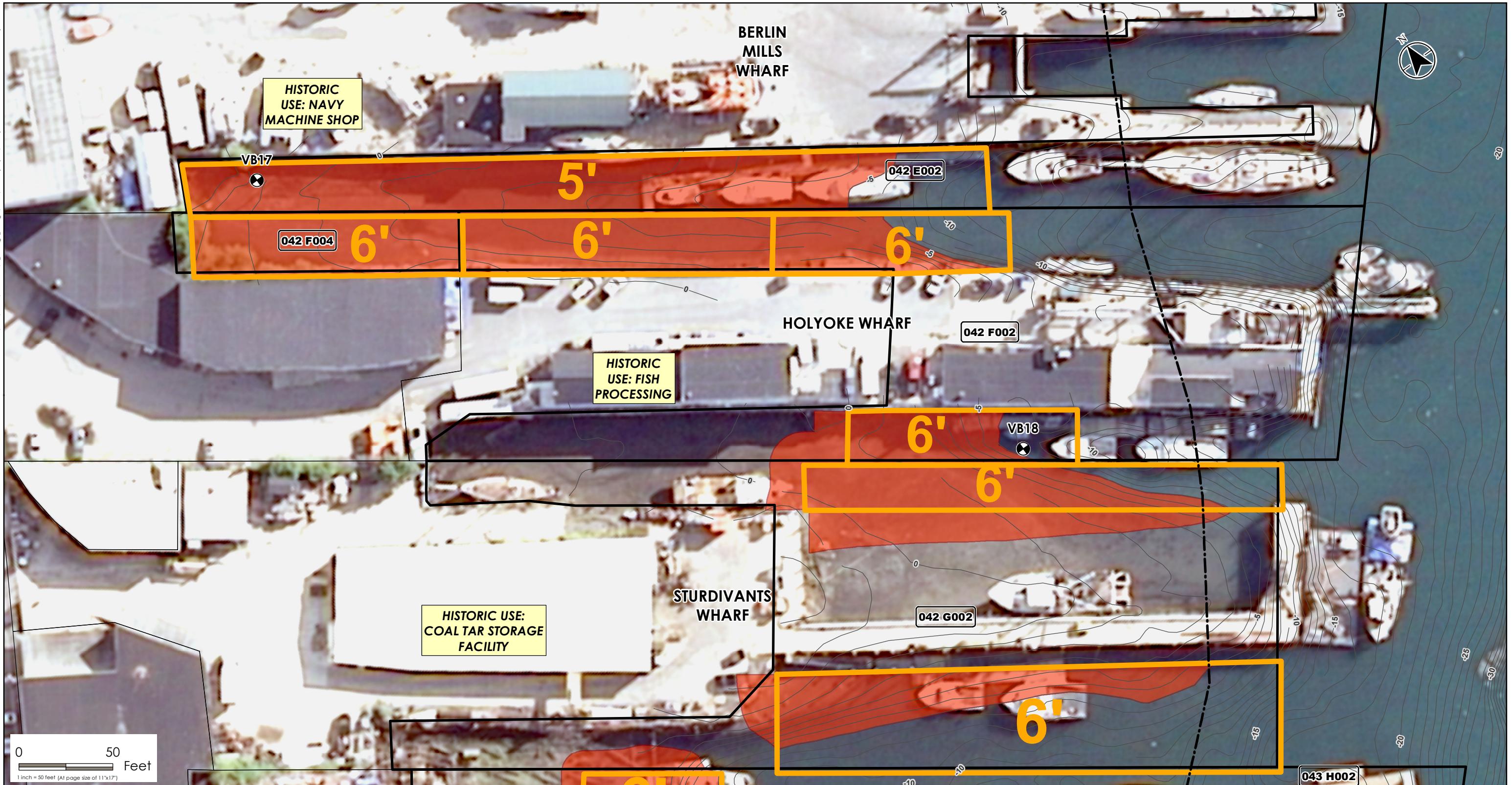
Portland Harbor Commission
Bulk Chemistry Dredge
Sediment Sampling
Figure No.

Title

**Hobson's Pier/Berlin Mills Wharf (N)
Proposed Dredge**

11/8/2019

Owner	Pier/Area	Map_Book_Lot	Estimated Dredge Volume (c.y.)
Hobson Pier, Inc.	Hobson's Pier	042 D002, D003	789
Berlin Mills Wharf	Berlin Mills Wharf (N)	042 E002	1,553



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195601199



30 Park Drive
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Phone (207) 729-1199

12-HolyokeWharf.mxd

**Legend**

- Stormwater Outfall
- 1' Bathymetric Contour
- Wharf Owner Tax Parcel and Map/Lot
- Tax Parcel

— Approximate Submerged Lands Regulatory Limit

□ Dredge Limit and Target Depth

■ Estimated Dredge Area

● Vibracore Sample Location

Owner	Pier/Area	Map Book Lot	Estimated Dredge Volume (c.y.)
Berlin Mills Wharf	Berlin Mills Wharf (S)	042 E002	1,808
Harbor Fish Market, Inc.	Holyoke Wharf	042 F004	1,217
General Marine Construction Corp.	Holyoke Wharf	042 F002	1,868
Sturdivant's Wharf, Inc.	Sturdivant's Wharf (N)	042 G002	1,409

Notes:

- Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet
- Hydrographic bathymetric survey performed by Apex Companies, LLC. between November 29, 2016 through December 1, 2016.
- Hydrographic survey datum is referenced to Mean Lower Low Water (MLLW) 1983-2001 tidal epoch. The correction from NAVD88 to MLLW is 5.25 feet for Casco Bay.
- Elevation assumptions were made to the existing bathymetric surfaces where elevation data was missing to complete proposed dredge footprints. Results in those areas is approximate.
- An additional 1' overdredge has been applied to each proposed dredge area.
- 2018 coastal Casco Bay aerial orthophotos provided by the State of Maine, Maine Office of GIS and Maine GeoLibrary Board.

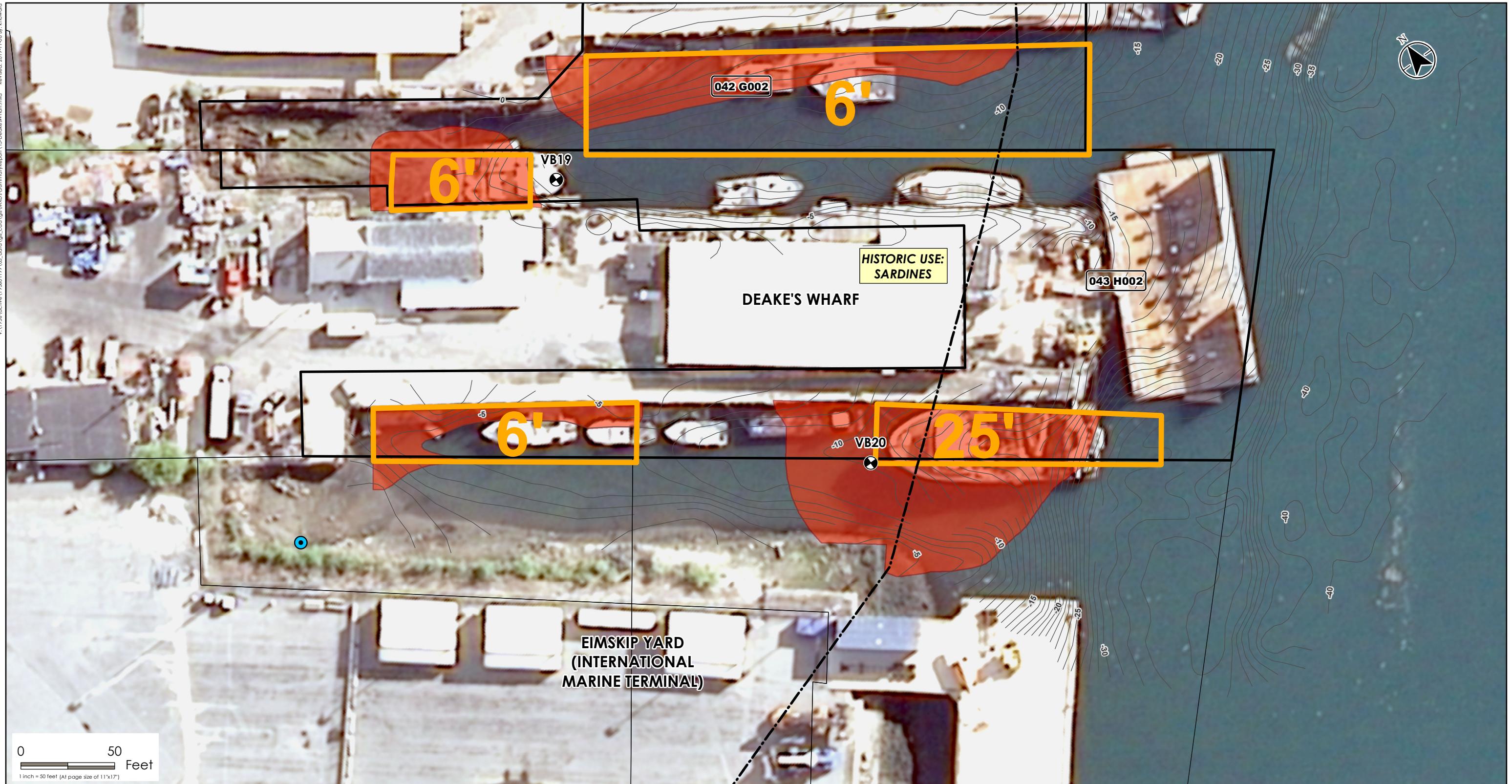
Client/Project

Portland Harbor Commission
Bulk Chemistry Dredge
Sediment Sampling
Figure No.

Title

**Berlin Mills (S)/Holyoke Wharf
Sturdivants Wharf (N) Proposed Dredge**

11/8/2019



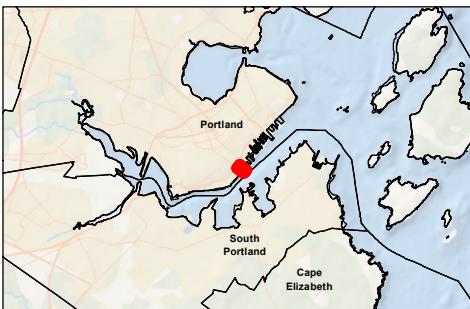
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195601199



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Phone (207) 729-1199

13-DeakesWharf.mxd

**Legend**

- Stormwater Outfall
- 1' Bathymetric Contour
- Wharf Owner Tax Parcel and Map/Lot
- Tax Parcel

- Approximate Submerged Lands Regulatory Limit
- Dredge Limit and Target Depth
- Estimated Dredge Area
- Vibracore Sample Location

Notes:

1. Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet
2. Hydrographic bathymetric survey performed by Apex Companies, LLC. between November 29, 2016 through December 1, 2016.
3. Hydrographic survey datum is referenced to Mean Lower Low Water (MLLW) 1983-2001 tidal epoch. The correction from NAVD88 to MLLW is 5.25 feet for Casco Bay.
4. Elevation assumptions were made to the existing bathymetric surfaces where elevation data was missing to complete proposed dredge footprints. Results in those areas is approximate.
5. An additional 1' overdredge has been applied to each proposed dredge area.
6. 2018 coastal Casco Bay aerial orthophotos provided by the State of Maine, Maine Office of GIS and Maine GeoLibrary Board.

Client/Project
Portland Harbor Commission
Bulk Chemistry Dredge
Sediment Sampling
Figure No.

Title

**Sturdivant's Wharf (S)/Deake's Wharf
Proposed Dredge**

11/8/2019

Owner	Pier/Area	Map Book_Lot	Estimated Dredge Volume (c.y.)
Sturdivant's Wharf, Inc.	Sturdivant's Wharf (S)	042 G002	731
General Marine Construction Corp.	Deake's Wharf	043 H002	3,875



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Phone (207) 729-1199

14-PortlandShipyard.mxd

**Legend**

- Stormwater Outfall
- 1' Bathymetric Contour
- Wharf Owner Tax Parcel and Map/Lot
- Tax Parcel

— Approximate Submerged Lands Regulatory Limit

□ Dredge Limit and Target Depth

■ Estimated Dredge Area

● Vibracore Sample Location

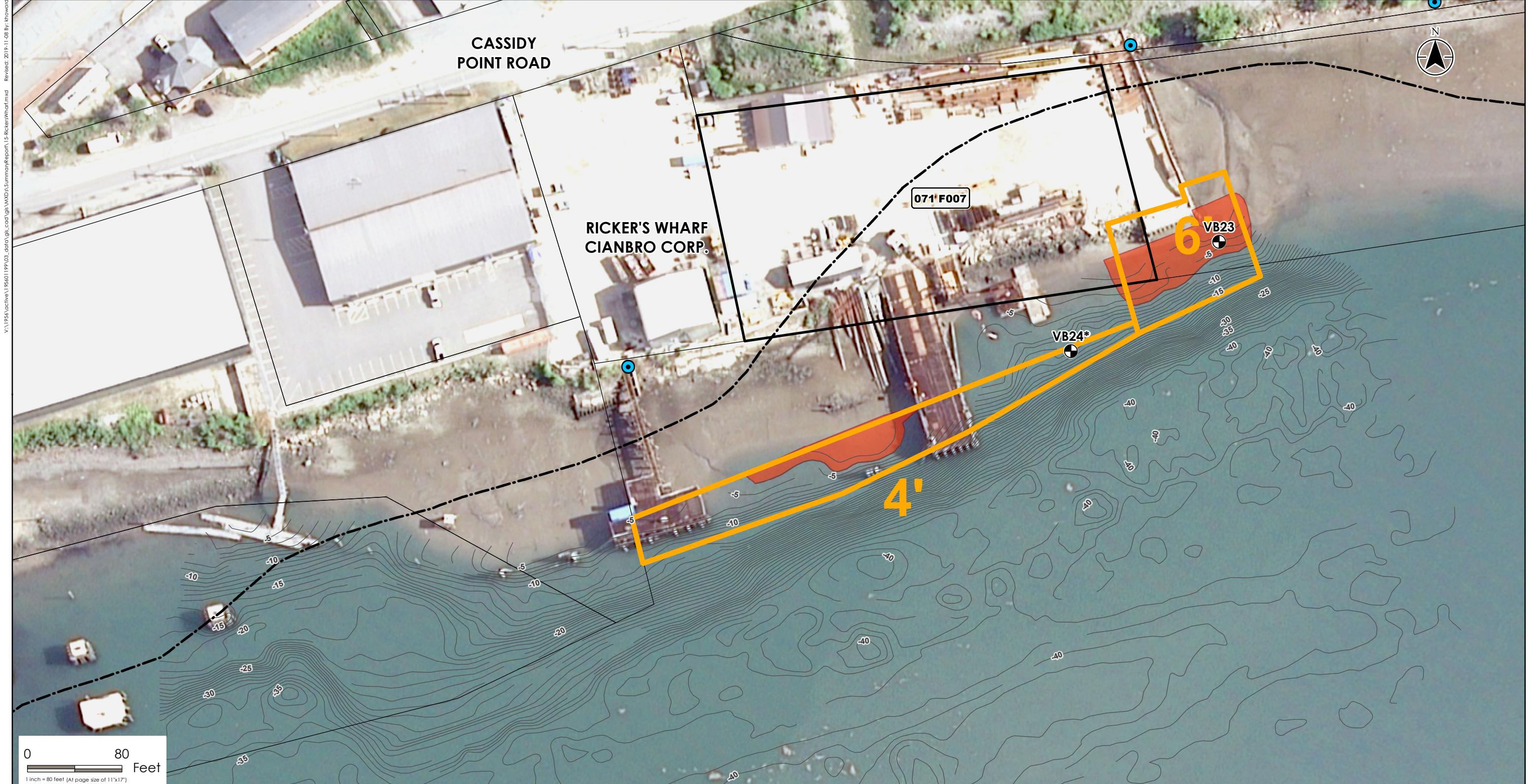
Notes:

1. Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet
2. Hydrographic bathymetric survey performed by Apex Companies, LLC. between November 29, 2016 through December 1, 2016.
3. Hydrographic survey datum is referenced to Mean Lower Low Water (MLLW) 1983-2001 tidal epoch. The correction from NAVD88 to MLLW is 5.25 feet for Casco Bay.
4. Elevation assumptions were made to the existing bathymetric surfaces where elevation data was missing to complete proposed dredge footprints. Results in those areas is approximate.
5. An additional 1' overdredge has been applied to each proposed dredge area.
6. 2018 coastal Casco Bay aerial orthophotos provided by the State of Maine, Maine Office of GIS and Maine GeoLibrary Board.

Client/Project
Portland Harbor Commission
Bulk Chemistry Dredge
Sediment Sampling
Figure No.

Title
Portland Shipyard Proposed Dredge
11/8/2019

Owner	Pier/Area	Map_Book_Lot	Estimated Dredge Volume (c.y.)
New Yard LLC	Portland Shipyard	060 F003, 059 A004	3,361

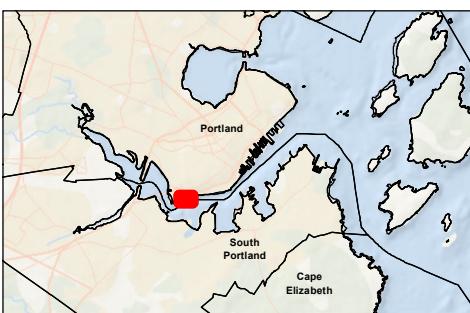


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30 Park Drive
Topsham, ME USA 04086
Phone (207) 729-1199

15-RickersWharf.mxd



Legend

- Stormwater Outfall
- 1' Bathymetric Contour
- Wharf Owner Tax Parcel and Map/Lot
- Tax Parcel

- Approximate Submerged Lands Regulatory Limit
- Dredge Limit and Target Depth
- Estimated Dredge Area
- Vibracore Sample Location

Notes:

- Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet
- Hydrographic bathymetric survey performed by Apex Companies, LLC. between November 29, 2016 through December 1, 2016.
- Hydrographic survey datum is referenced to Mean Lower Low Water (MLLW) 1983-2001 tidal epoch. The correction from NAVD88 to MLLW is 5.25 feet for Casco Bay.
- Elevation assumptions were made to the existing bathymetric surfaces where elevation data was missing to complete proposed dredge footprints. Results in those areas is approximate.
- An additional 1' overdepth has been applied to each proposed dredge area.
- 2018 coastal Casco Bay aerial orthophotos provided by the State of Maine, Maine Office of GIS and Maine GeoLibrary Board.

Client/Project
Portland Harbor Commission
Bulk Chemistry Dredge
Sediment Sampling
Figure No.

Title
**Ricker's Wharf Cianbro Corp.
Proposed Dredge**
11/8/2019

195601199

Owner	Pier/Area	Map_Book_Lot	Estimated Dredge Volume (c.y.)
Cianbro Corporation	Ricker's Wharf	071 F007	810

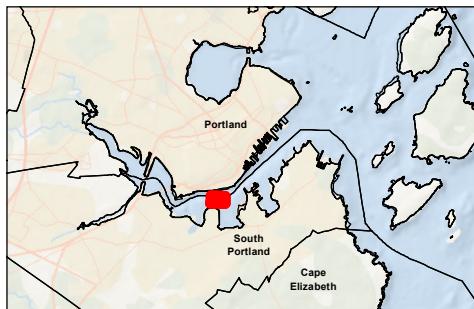


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16-TurnersIsland.mxd



Legend

- Stormwater Outfall
- 1' Bathymetric Contour
- Wharf Owner Tax Parcel and Map/Lot
- Tax Parcel

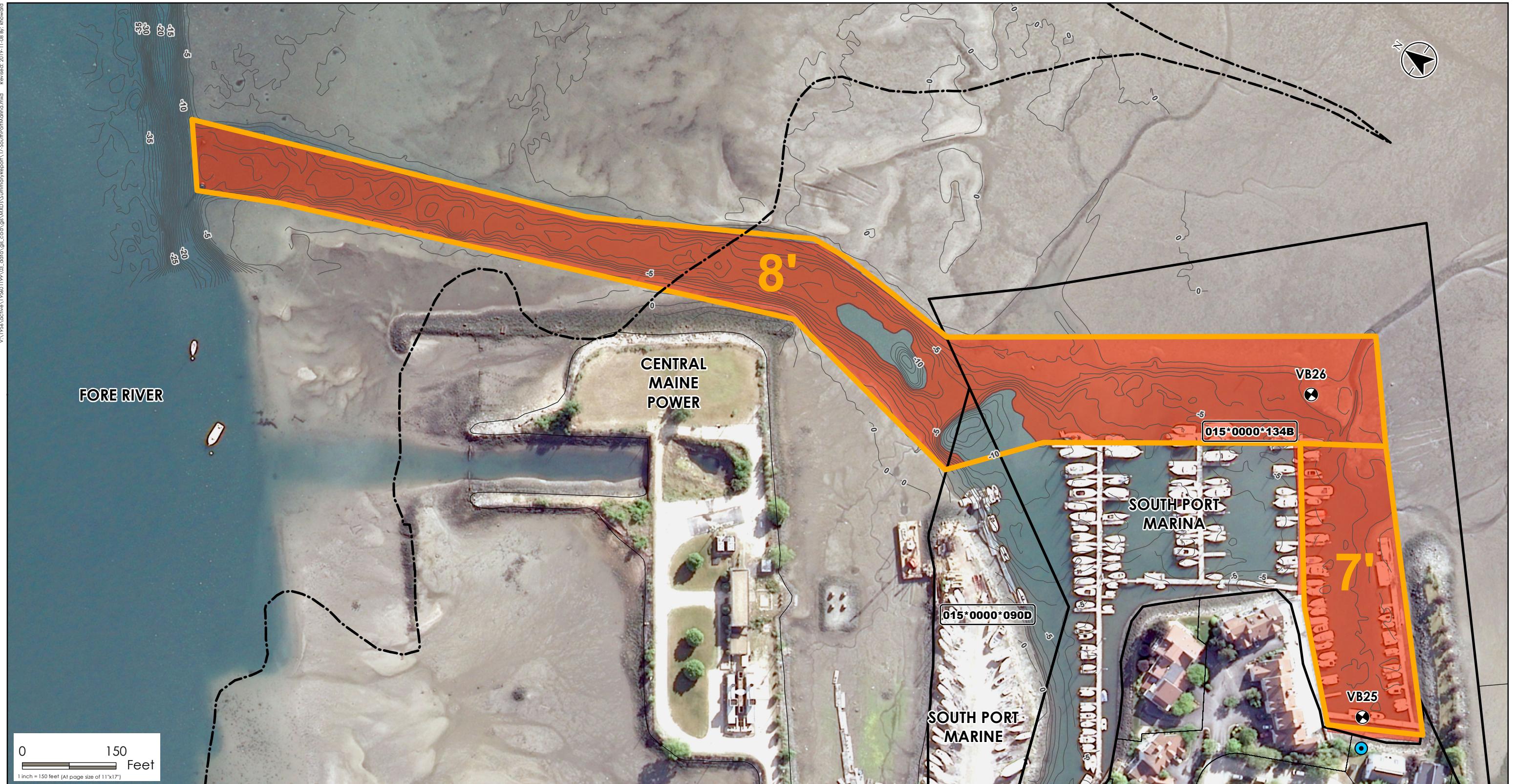
- Approximate Submerged Lands Regulatory Limit
- Dredge Limit and Target Depth
- Estimated Dredge Area
- Vibracore Sample Location

Notes:

- Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet
- Bathymetric contours derived from a January 2008 "Existing Conditions Plan" produced by Post Road Surveying and are approximate.
- Hydrographic survey datum is referenced to Mean Lower Low Water (MLLW) 1983-2001 tidal epoch. The correction from NAVD88 to MLLW is 5.25 feet for Casco Bay.
- Elevation assumptions were made to the existing bathymetric surfaces where elevation data was missing to complete proposed dredge footprints. Results in those areas is approximate.
- An additional 1' overdredge has been applied to each proposed dredge area.
- 2018 coastal Casco Bay aerial orthophotos provided by the State of Maine, Maine Office of GIS and Maine GeoLibrary Board.

Client/Project
Portland Harbor Commission
Bulk Chemistry Dredge
Sediment Sampling
Figure No.

Title
Turners Island Proposed Dredge
11/8/2019



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Phone (207) 729-1199

17-SouthPortMarina.mxd

**Legend**

- Stormwater Outfall
- 1' Bathymetric Contour
- Wharf Owner Tax Parcel and Map/Lot
- Tax Parcel
- Approximate Submerged Lands Regulatory Limit
- Dredge Limit and Target Depth
- Estimated Dredge Area
- Vibracore Sample Location

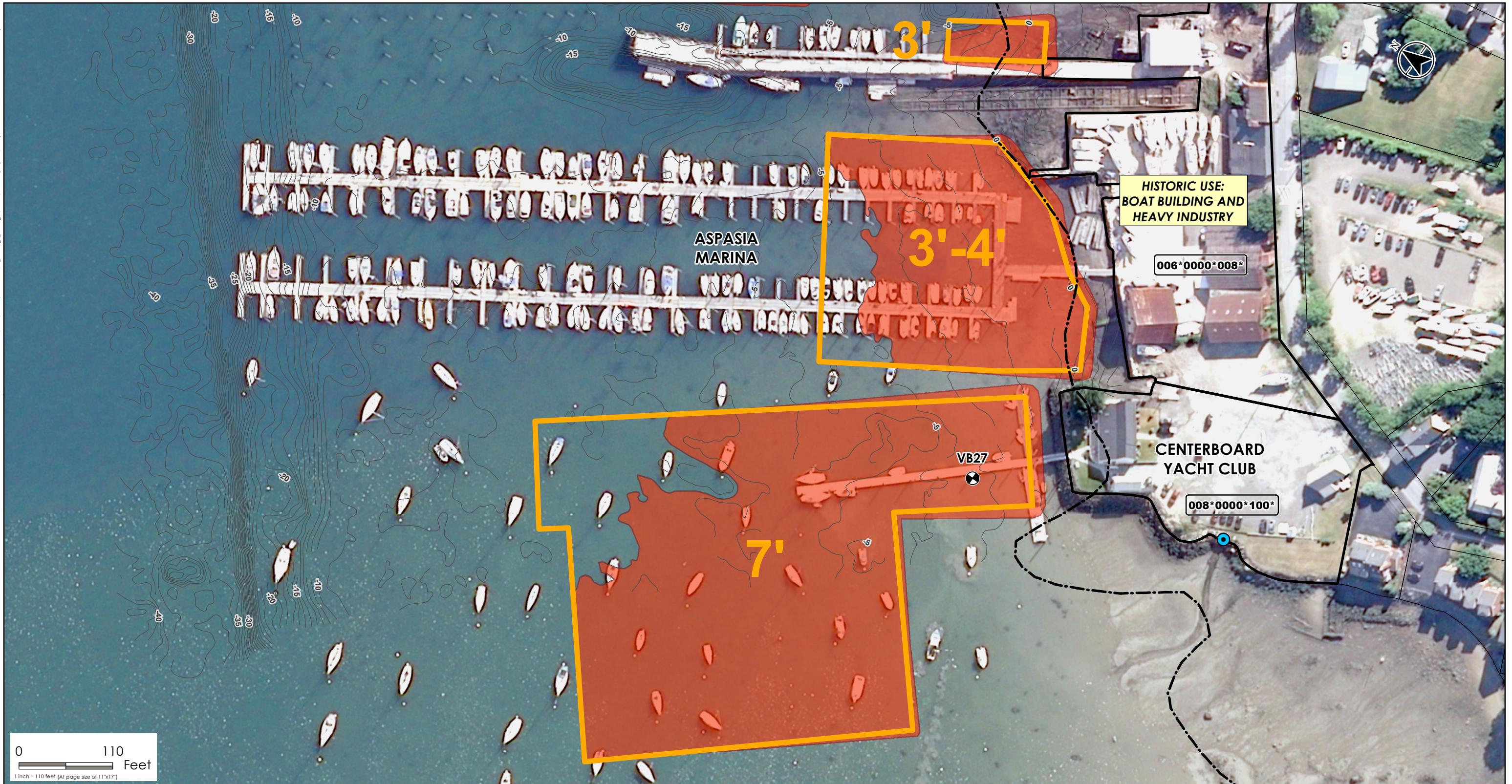
Owner	Pier/Area	Map_Book_Lot	Estimated Dredge Volume (c.y.)
South Port Marine, LLC	South Port Marina	015*0000*090D, 015*0000*134B	44,679

Notes:

1. Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet
2. Hydrographic bathymetric survey performed by Apex Companies, LLC. between November 29, 2016 through December 1, 2016.
3. Hydrographic survey datum is referenced to Mean Lower Low Water (MLLW) 1983-2001 tidal epoch. The correction from NAVD88 to MLLW is 5.25 feet for Casco Bay.
4. Elevation assumptions were made to the existing bathymetric surfaces where elevation data was missing to complete proposed dredge footprints. Results in those areas is approximate.
5. An additional 1' overdredge has been applied to each proposed dredge area.
6. 2018 coastal Casco Bay aerial orthophotos provided by the State of Maine, Maine Office of GIS and Maine GeoLibrary Board.

Client/Project
Portland Harbor Commission
Bulk Chemistry Dredge
Sediment Sampling
Figure No.

Title
South Port Marina
Proposed Dredge
11/8/2019



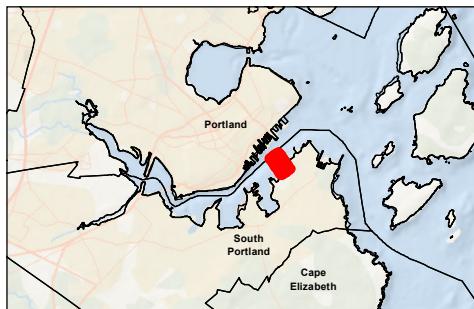
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195601199



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Phone (207) 729-1199

18-AspasiaMarina.mxd

**Legend**

- Stormwater Outfall
- 1' Bathymetric Contour
- Wharf Owner Tax Parcel and Map/Lot
- Tax Parcel

— Approximate Submerged Lands Regulatory Limit

■ Dredge Limit and Target Depth

■ Estimated Dredge Area

● Vibracore Sample Location

Notes:

1. Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet
2. Hydrographic bathymetric survey performed by Apex Companies, LLC. between November 29, 2016 through December 1, 2016.
3. Hydrographic survey datum is referenced to Mean Lower Low Water (MLLW) 1983-2001 tidal epoch. The correction from NAVD88 to MLLW is 5.25 feet for Casco Bay.
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5. An additional 1' overdredge has been applied to each proposed dredge area.
6. 2018 coastal Casco Bay aerial orthophotos provided by the State of Maine, Maine Office of GIS and Maine GeoLibrary Board.

Client/Project

Portland Harbor Commission
Bulk Chemistry Dredge
Sediment Sampling
Figure No.

Title

**Centerboard YC/Aspasia Marina
Proposed Dredge**

11/8/2019

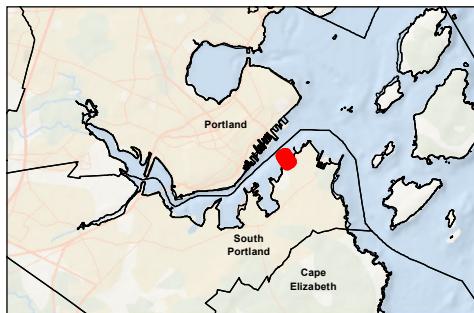


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Phone (207) 729-1199



Legend

- Stormwater Outfall
- 1' Bathymetric Contour
- Wharf Owner Tax Parcel and Map/Lot
- Tax Parcel

Owner	Pier/Area	Map_Book_Lot	Estimated Dredge Volume (c.y.)
City of South Portland	South Portland City Pier		2,348
Offshore Ventures, LLC	Sunset Marina	006*0000*007C	15,371
Saltwater Grille	Saltwater Grille	006*0000*007A	3,442

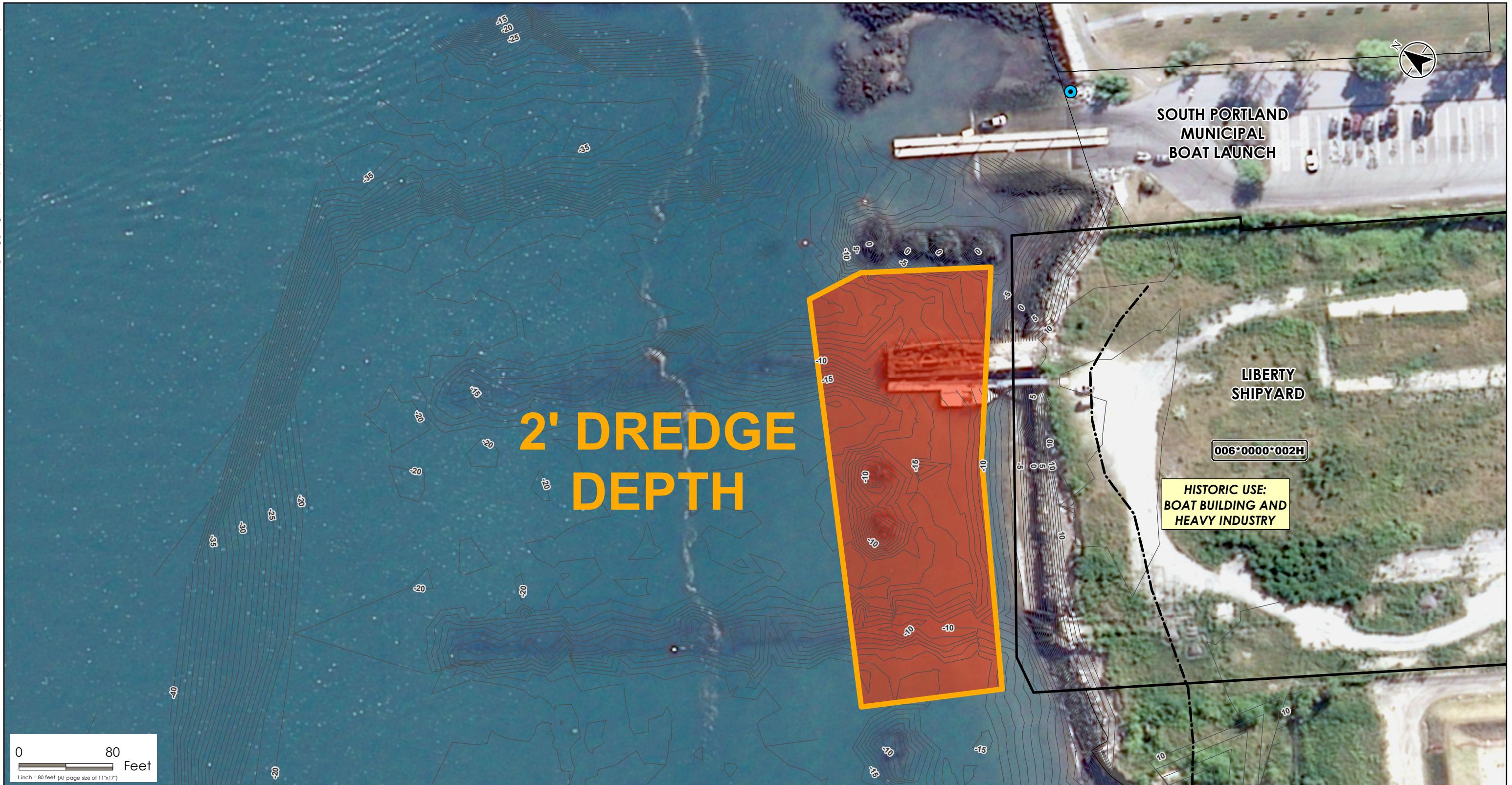
Notes:

- Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet
- Hydrographic bathymetric survey performed by Apex Companies, LLC. between November 29, 2016 through December 1, 2016.
- Hydrographic survey datum is referenced to Mean Lower Low Water (MLLW) 1983-2001 tidal epoch. The correction from NAVD88 to MLLW is 5.25 feet for Casco Bay.
- Elevation assumptions were made to the existing bathymetric surfaces where elevation data was missing to complete proposed dredge footprints. Results in those areas is approximate.
- An additional 1' overdredge has been applied to each proposed dredge area.
- 2018 coastal Casco Bay aerial orthophotos provided by the State of Maine, Maine Office of GIS and Maine GeoLibrary Board.

Client/Project
Portland Harbor Commission
Bulk Chemistry Dredge
Sediment Sampling
Figure No.

Title

South Portland City Pier/Sunset Marina and Saltwater Grille Proposed Dredge
11/8/2019

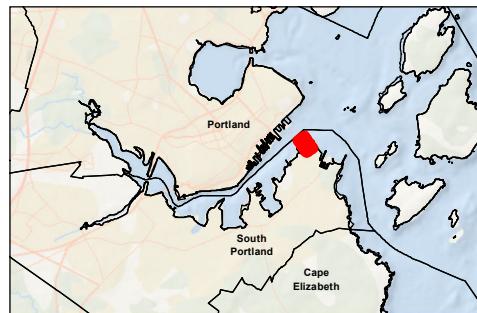


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30 Park Drive
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20-LibertyShipyard.mxd



Legend

- Stormwater Outfall
- 1' Bathymetric Contour
- Wharf Owner Tax Parcel and Map/Lot
- Tax Parcel

Owner	Pier/Area	Map_Book_Lot	Estimated Dredge Volume (c.y.)
L & North Points Holdings	Liberty Shipyard	006*0000*002H	6,444

Notes:

1. Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet
2. Bathymetric contours provided by TEC Associates survey date July 1, 2019.
3. Hydrographic survey datum is referenced to Mean Lower Low Water (MLLW) 1983-2001 tidal epoch. The correction from NAVD88 to MLLW is 5.25 feet for Casco Bay.
4. Elevation assumptions were made to the existing bathymetric surfaces where elevation data was missing to complete proposed dredge footprints. Results in those areas is approximate.
5. An additional 1' overdredge has been applied to each proposed dredge area.
6. 2018 coastal Casco Bay aerial orthophotos provided by the State of Maine, Maine Office of GIS and Maine GeoLibrary Board.

Client/Project

Portland Harbor Commission
Bulk Chemistry Dredge
Sediment Sampling
Figure No.

Title

**Liberty Shipyard
Proposed Dredge**
11/8/2019



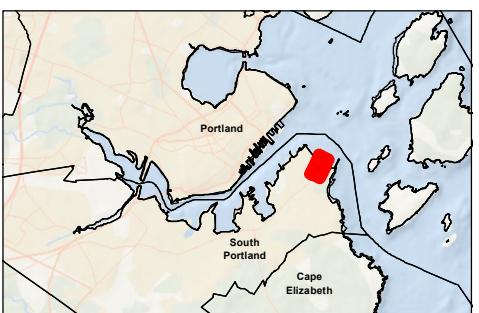
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195601199



30 Park Drive
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21-SpringPointMarina.mxd



Legend

- Stormwater Outfall
- 1' Bathymetric Contour
- Wharf Owner Tax Parcel and Map/Lot
- Tax Parcel
- Vibracore Sample Location

--- Approximate Submerged Lands Regulatory Limit

□ Dredge Limit and Target Depth

■ Estimated Dredge Area

Notes:

1. Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet
2. Hydrographic bathymetric survey performed by Apex Companies, LLC. between November 29, 2016 through December 1, 2016.
3. Hydrographic survey datum is referenced to Mean Lower Low Water (MLLW) 1983-2001 tidal epoch. The correction from NAVD88 to MLLW is 5.25 feet for Casco Bay.
4. Elevation assumptions were made to the existing bathymetric surfaces where elevation data was missing to complete proposed dredge footprints. Results in those areas is approximate.
5. An additional 1' overdredge has been applied to each proposed dredge area.
6. 2018 coastal Casco Bay aerial orthophotos provided by the State of Maine, Maine Office of GIS and Maine GeoLibrary Board.

Client/Project
Portland Harbor Commission
Bulk Chemistry Dredge
Sediment Sampling
Figure No.

Title
Breakwater/Spring Point Marina Proposed Dredge
11/8/2019

Owner	Pier/Area	Map Book Lot	Estimated Dredge Volume (c.y.)
Spring Point Marina	Spring Point Marina	004*0000*005C	25,144
RCST, Inc.	Breakwater Marina	004*0000*005A	7,565

Appendix C (Available Upon Request)

Modified Burmister Method

Appendix D

Vibration Core Logs

Date: 11/9/17

BORING LOG

Project: Portland CAD		Project No: 0116-089-04	X:		
Location: Proposed CAD location		Y:			
Elevation at grade: Datum: MLLW					
Casing Type: Steel		Boring Depth: 8.0'	Boring No: VB-3		
Casing Diameter: 4"		Drill Rig:			
Drill Co: Apex		Method: <u>Vibracore</u>			
Driller: <u>Kias/Batt</u>		Log By: <u>G Daniels</u>	Sheet: 1 of 1		
Depth below surface grade (ft)	RQD	Penetration rate Recovery	Blows per ft / Drill Min. per Foot	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%	Elevation (MLLW)
				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel.	
0 - 6.0				<u>Black Fine Sand, Some silt, trace clay</u>	
Notes/ Comments:		1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column repres the elevation of the bottom of the respective split-spoon, core run, or drill tool.			
Refusal:		<u>6.0 recovery</u>			
Elevation of Bedrock:					

Date: 11/3/17

BORING LOG

Project: Portland CAD				Project No: 016-034-00	X:
Location: Proposed CAD location				Y:	
Elevation at grade: Datum: MLLW					
Casing Type: Steel		Boring Depth: 5'		Boring No: VB-26	
Casing Diameter: 4"		Drill Rig:			
Drill Co: Apex		Method: Vibracone			
Driller: K. Asl Brott.		Log By: G. Daukars		Sheet: 1 of 1	
Depth below surface grade (ft)	RQD	Penetration Recovery	Blows per ft / Drill Min. per Foot	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%	Elevation (MLLW)
				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel.	
0-4				Black fine sand, Some silt, trace clay	
				Sample ID: CSS-13 1500	
				Composite with VB-25	
Notes/ Comments: 1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column repres the elevation of the bottom of the respective split-spoon, core run, or drill tool.					
Refusal:		4' Recovery			
Elevation of Bedrock:					

Date: 11/8/17

BORING LOG

Project: Portland CAD		Project No: 0116-289-00	X:
Location: Proposed CAD location			Y:
Elevation at grade: Datum: MLLW			
Casing Type: Steel	Boring Depth: 45'	Boring No: VB-25	
Casing Diameter: 4"	Drill Rig:		
Drill Co: Apex	Method: Vibracore		
Driller: KAS/Brett	Log By: G. Drakes	Sheet: 1 of 1	
Depth below surface grade (ft)	RQD	Penetration Recovery	Blows per 6' / Drill Min. per Foot
			Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%
			EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel.
0-3'			Black fine sand, some silt.
Notes/ Comments:	1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column repres the elevation of the bottom of the respective split-spoon, core run, or drill tool.		
Refusal:	Recovery 3		
Elevation of Bedrock:			

Date: 11/8/17

BORING LOG

Project: Portland CAD Location: Proposed CAD location				Project No: 0116-282-00	X: Y:
Elevation at grade: Datum: MLLW				Boring No: VB-5	
Casing Type: Steel		Boring Depth: 50			
Casing Diameter: 4"		Drill Rig:			
Drill Co: Apex		Method: Vibracore			
Driller: Kins/Brett		Log By: G Dankas		Sheet: 1 of 1	
Depth below surface grade (ft)	RQD	Penetration Recovery	Blows per ft / Drill Min. per Foot	Description (Color, Texture, Structure) Trace, < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%	
				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel.	
0-5'				Clay Gray - Presumpt	
				No sample collected.	
Notes/ Comments:		1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column repres the elevation of the bottom of the respective split-spoon, core run, or drill tool.			
Refusal:					
Elevation of Bedrock:					

Date: 11/8/17

BORING LOG

Project: Portland CAD		Project No: 0116-289-02	X:
Location: Proposed CAD location		Y:	
Elevation at grade: Datum: MLLW		Boring No: VB-6	
Casing Type: Steel	Boring Depth: 7.5		
Casing Diameter: 4"	Drill Rig:		
Drill Co: Apex	Method: Vibracore		
Driller: KASB	Log By: G. Dankas	Sheet: 1 of 1	
Depth below surface grade (ft)	RQD	Penetration Recovery	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%
			EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel.
0-4'			Black fine sand, some med to coarse sand, trace gravel, trace silt.
Notes/ Comments:		1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column repres the elevation of the bottom of the respective split-spoon, core run, or drill tool.	
Refusal:		Refused @ 7.5'	
Elevation of Bedrock:			
		Elevation (MLLW)	

Date: 11/8/17

BORING LOG

Project: Portland CAD		Project No: 016289-AU		X:			
Location: Proposed CAD location				Y:			
Elevation at grade: Datum: MLLW		Casing Type: Steel Boring Depth: 4.5 Casing Diameter: 4" Drill Co: Apex Method: Vibracore Driller: K. Asl. Dart Log By: G. Daniels Sheet: 1 of 1					
Casing Type: Steel					Boring Depth: 4.5		Boring No: VB-Z1
Casing Diameter: 4"					Drill Rig:		
Drill Co: Apex					Method: Vibracore		
Driller: K. Asl. Dart		Log By: G. Daniels					
Depth below surface (ft)	RQD	Penetration Recovery	Blows per ft / Drill Min. per Foot	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%	Elevation (MLLW)		
				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel.			
0-4.5				Black fine sand, trace mud, trace silt.			
				Sample ID CSP-11 0900			
				Composite with VB-22			
Notes/ Comments:		1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column repres the elevation of the bottom of the respective split-spoon, core run, or drill tool.					
Refusal:							
Elevation of Bedrock:							

Date: 11/8/17

BORING LOG

Project: Portland CAD				Project No: 0116-299-00	X:
Location: Proposed CAD location				Y:	
Elevation at grade: Datum: MLLW					
Casing Type: Steel Boring Depth: 10.0'				Boring No: VB - 22	
Casing Diameter: 4" Drill Rig:					
Drill Co: Apex Method: Vibracore					
Driller: KLAS/Brett Log By: G. Douglas				Sheet: 1 of 1	
Depth below surface grade (ft)	RQD	Penetration Recovery	Blows per 6' / Drill Min. per Foot	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%	Elevation (MLLW)
0-3'				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel. Black Fine Sand, little Silt, trace med sand Soft.	
3'-5'				Black Fine Sand, little Silt, trace med sand trace clay cohesive	
5'-8'				Yellow/Brown medium sand and and coarse sand, little gravel.	
8'-9'				Same as 3-5'	
				Sample ID: CSP-11	
				Composite with VB-21	
Notes/ Comments:		1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column repres the elevation of the bottom of the respective split-spoon, core run, or drill tool.			
Refusal:		Recovery 9.0'			
Elevation of Bedrock:					

Date: 14/7/17

BORING LOG

Project: Portland CAD				Project No: 0110-289-00	X:
Location: Proposed CAD location				Y:	
Elevation at grade: Datum: MLLW				Boring No: VB-20	
Casing Type: Steel		Boring Depth: 10'			
Casing Diameter: 4"		Drill Rig:			
Drill Co: Apex		Method: Vibracore			
Driller: <u>Kris Britt</u>		Log By: G. Daukas		Sheet: 1 of 1	
Depth below surface grade (ft)	RQD	Penetration Recovery	Blows per 6' / Drill Min. per Foot	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%	Elevation (MLLW)
				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel.	
0-2'				Gray Clay trace Fines and trace shells	
2-10'				Gray clay Presumptive formation	
				Sampled 0-2'	
				Sample ID CSP-10 1630	
				Composite with VB-19	
Notes/ Comments:		1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column repres the elevation of the bottom of the respective split-spoon, core run, or drill tool.			
Refusal:		<u>Recovery 10'</u>			
Elevation of Bedrock:					

Date: 11/7/12

BORING LOG

Project: Portland CAD				Project No: 0116289-00	X:
Location: Proposed CAD location				Y:	
Elevation at grade: Datum: MLLW				Boring No: VB-19	
Casing Type: Steel		Boring Depth: 4'			
Casing Diameter: 4"		Drill Rig:			
Drill Co: Apex		Method: Vibracone			
Driller: KAS/Brett		Log By: G. Daukas		Sheet: 1 of 1	
Depth below surface grade (ft)	RQD	Penetration Recovery	Blows per 6' / Drill Min. per Foot	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%	Elevation (MLLW)
0-1'				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel. <i>Black fine sand, trace med sand, trace silt.</i>	
1-2'				<i>Black/gray fine sand trace med sand, trace silt</i>	
2-4'				<i>Brown med sand, some coarse sand trace gravel.</i>	
				<i>Sample ID CSP-10</i>	
				<i>Composite with VB-20</i>	
Notes/ Comments:		1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column repres the elevation of the bottom of the respective split-spoon, core run, or drill tool.			
Refusal:		<i>Refusal @ 4' Recovery: 4.0'</i>			
Elevation of Bedrock:					

Date: 11/7/17

BORING LOG

Project: Portland CAD				Project No: 016-289-00	X:
Location: Proposed CAD location				Y:	
Elevation at grade: Datum: MLLW					
Casing Type: Steel		Boring Depth: 5.5'		Boring No: VB-18	
Casing Diameter: 4"		Drill Rig:			
Drill Co: Apex		Method: Vibracore			
Driller: Kias Brett		Log By: G. Daukas		Sheet: 1 of 1	
Depth below surface grade (ft)	RQD	Penetration Recovery	Blows per 6' / Drill Min. per Foot	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%	Elevation (MLLW)
				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel.	
0-1.5				Black Silt, trace fine sand, and fish scales	
Notes/ Comments:		1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column repres the elevation of the bottom of the respective split-spoon, core run, or drill tool.			
Refusal:		Recovery 1.5'			
Elevation of Bedrock:					

Date: 11/7/17

BORING LOG

Project: Portland CAD		Project No: 0116-289-0		X:
Location: Proposed CAD location		Y:		
Elevation at grade: Datum: MLLW				
Casing Type: Steel	Boring Depth: 2'	Boring No: VB-17		
Casing Diameter: 4"	Drill Rig:			
Drill Co: Apex	Method: VibraCore			
Driller: KIAS/Brett	Log By: G. Daukas	Sheet: 1 of 1		
Depth below surface grade (ft)	RQD	Penetration Recovery	Blows per 6' / Drill Min. per Foot	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%
0-1.5				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel. Black Fine sand, Some med Sand, little coarse sand, trace gravel very soft.
1.5-2.0				Black Fine sand, trace med Sand's trace silt. Soft.
Notes/ Comments:	1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column repres the elevation of the bottom of the respective split-spoon, core run, or drill tool.			
Refusal:	Refusal @ 2 ft. 2' Recovery			
Elevation of Bedrock:				

Date: 10/31/17

BORING LOG

Project: Portland CAD Location: Proposed CAD location				Project No: 0116-089-00	X: Y:
Elevation at grade: Datum: MLLW				Boring No: VB-23 Ricker's	
Casing Type: Steel				Sheet: 1 of 1	
Casing Diameter: 4"					
Drill Co: Apex					
Driller: <u>Tias Britt</u>					
Depth below surface grade (ft)	RQD	Penetration Recovery	Blows per 6' / Drill Min. per Foot	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%	Elevation (MLLW)
				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel.	
0-2'				<u>Black Silt, trace fine Sand, trace med sand. No Stratification</u>	
2'-5'				<u>Gray clay, Presumptive formation</u>	
				<u>Composite with VB-24 QD</u>	
				<u>SAMPLE ID - CSP-1Z</u>	
				<u>Reference Sample</u>	
Notes/ Comments:		1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column repres the elevation of the bottom of the respective split-spoon, core run, or drill tool.			
Refusal:					
Elevation of Bedrock:					

Date: 11/2/17

BORING LOG

Project: Portland CAD Location: Proposed CAD location				Project No: 0116-289-00	X: Y:
Elevation at grade: Datum: MLLW				Boring No: VB-27	
Casing Type: Steel Boring Depth: 6.0'				Sheet: 1 of 1	
Casing Diameter: 4"					
Drill Co: Apex Method: Vibracore					
Driller: Kins/Brett Log By: G. Daubes					
Depth below surface grade (ft)	RQD	Penetration Recovery	Blows per 6' / Drill Min. per Foot	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%	Elevation (MLLW)
				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel.	
			0-3'	Gray/Brown Fine Sand, little silt, trace med sand, trace coarse sand, trace gravel, trace shells soft.	
			3-5.5'	Gray Fine Sand, trace med sand, trace silt. medium stiff trace gravel	
				Sample ID: CSS-14 1200	
				Composite with CSS-28 VB-28	
Notes/ Comments: 1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column repres the elevation of the bottom of the respective split-spoon, core run, or drill tool.					
Refusal: Recovery -5.5'					
Elevation of Bedrock:					

Date: 11/11/17

BORING LOG

Project: Portland CAD		Project No: 0116-289-00	X:		
Location: Proposed CAD location			Y:		
Elevation at grade: Datum: MLLW		Boring No: VB-28 Drill Rig: Method: Vibracore Log By: G.Drakas Sheet: 1 of 1			
Casing Type: Steel				Boring Depth: 3.5'	
Casing Diameter: 4"					
Drill Co: Apex					
Driller: KIAS / Brette					
Depth below surface grade (ft)	RQD	Penetration Recovery	Blows per 6' / Drill Min. per Foot	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%	Elevation (MLLW)
				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel.	
0-3.5				Gray / Lt. brown silt some fine sand, trace med. gravel.	
				Sample ID CSS-14 120c	
				Composite with SP VB-27 CSS VB-28 go	
Notes/ Comments: 1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column repres the elevation of the bottom of the respective split-spoon, core run, or drill tool.					
Refusal:		Realty 3.5'			
Elevation of Bedrock:					

Date: 11/11/17

BORING LOG

Project: Portland CAD		Project No: 0116-289-00		X:
Location: Proposed CAD location		Y:		
Elevation at grade: Datum: MLLW		Boring No: VB-16		
Casing Type: Steel		Boring Depth: 3.5'		
Casing Diameter: 4"		Drill Rig:		
Drill Co: Apex		Method: Vibracorer		
Driller: Kias Brett		Log By: G. Daukas	Sheet: 1 of 1	
Depth below surface grade (ft)	RQD	Penetration Recovery	Blows per 6" / Drill Min. per Foot	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%
				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel.
0-1				Black Silt, trace fine Sand, trace Med Sand, trace Silt
1-2.5				Black fine Sand trace med sand, trace gravcoarse Sand,
Notes/ Comments:		1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column repres the elevation of the bottom of the respective split-spoon, core run, or drill tool.		
Refusal:		Recovery 2.5'		
Elevation of Bedrock:				

Date: 11/11/17

BORING LOG

Project: Portland CAD				Project No: 0111-269-00	X:
Location: Proposed CAD location				Y:	
Elevation at grade: Datum: MLLW					
Casing Type: Steel	Boring Depth: 5.5'			Boring No: VB - 8	
Casing Diameter: 4"	Drill Rig:				
Drill Co: Apex	Method: <u>Vibration</u>				
Driller: Kias/Brett	Log By: G. Daukas			Sheet: 1 of 1	
Depth below surface grade (ft)	RQD	Penetration Recovery	Blows per 6' / Drill Min. per Foot	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%	Elevation (MLLW)
				EXAMPLE: Black Organic Silt, trace fine sand, trace fine gravel.	
0-3'				Black Silt, trace fine Sand, trace Med. Sand, trace Gravel, trace Silt. Petroleum odor.	
				Sample ID CSP-4	
				Composited with VB-7	
Notes/ Comments:		1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column repres the elevation of the bottom of the respective split-spoon, core run, or drill tool.			
Refusal:		3' Recovery			
Elevation of Bedrock:					

Date: 10/16/17

BORING LOG

Project: Portland CAD				Project No: 1199	X:
Location: Proposed CAD location				Y:	
Elevation at grade: Datum: MLLW				Boring No: VB-8	
Casing Type: Steel		Boring Depth: 5'			
Casing Diameter: 4"		Drill Rig:			
Drill Co: Apex		Method:			
Driller: Kus / Beck		Log By: MJ / GD		Sheet: 1 of 1	
Depth below surface grade (ft)	RQD	Penetration Recovery	Blows per 6' / Drill Min. per Foot	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%. Some 20% to 35%, And 35% to 50%	Elevation (MLLW)
				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel. Black silt, trace fine sand, trace medium sand, trace gravel ↳ no stratification	
				* Planted cores do not contain shell hash	
Notes/ Comments:		1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column represent the elevation of the bottom of the respective split-spoon, core run, or drill tool.			
Refusal:		3'			
Elevation of Bedrock:					

Date: 11/1/17

BORING LOG

Project: Portland CAD				Project No: 0116-299-00	X:
Location: Proposed CAD location				Y:	
Elevation at grade: Datum: MLLW				Boring No: VB-7	
Casing Type: Steel		Boring Depth: 9.5'			
Casing Diameter: 4"		Drill Rig:			
Drill Co: Apex		Method: Vibracore			
Driller: Kias Brett		Log By: G. Daukas		Sheet: 1 of 1	
Depth below surface grade (ft)	RQD	Penetration Recovery	Blows per 6' / Drill Min. per Foot	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%	Elevation (MLLW)
				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel. Black coarse Sand and some gravel, little needle Sand, trace Fine Sand, trace Silt	
0-3.5'				Gray brown fine sand, little Silt, trace mud Sand, trace clay	
3.5-6.0				Gray Clay Presumpscot formation	
				Sample collected between 0-6.0 feet.	
				Sample ID CSP-4	
				Composted with VB-8	
Notes/ Comments:		1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column represent the elevation of the bottom of the respective split-spoon, core run, or drill tool.			
Refusal:		Recovery 9.5'			
Elevation of Bedrock:					

Date: 11/11/17

BORING LOG

Project: Portland CAD				Project No.: 0116-259-00	X:
Location: Proposed CAD location				Y:	
Elevation at grade: Datum: MLLW				Boring No: VB-15	
Casing Type: Steel		Boring Depth: 8.5'			
Casing Diameter: 4"		Drill Rig:			
Drill Co: Apex		Method: Vibrocore			
Driller: KHS / Brett		Log By: G. Danbar		Sheet: 1 of 1	
Depth below surface grade (ft)	RQD	Penetration Recovery	Blows per 6' / Drill Min. per Foot	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%	Elevation (MLLW)
				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel. Black Fine Sand, little medium sand, trace coarse sand, trace gravel, trace silt.	
0-1				Black Fine Sand, Some silt, trace med sand, trace organic fibers and wood chips	
2-3				Black Soapy fine sand and little Silt. No cohesion.	
3-5				Same as 0-1	
				Sample ID - CSP 3	
				Composite with VB-16	
				Reference Sample	
Notes/ Comments:		1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column represent the elevation of the bottom of the respective split-spoon, core run, or drill tool.			
Refusal:		8.5' 6.6 Recovery			
Elevation of Bedrock:					

Date: 11/11/17

BORING LOG

Project: Portland CAD				Project No.: 016-057-00	X:
Location: Proposed CAD location				Y:	
Elevation at grade: Datum: MLLW				Boring No: VB-1b	
Casing Type: Steel		Boring Depth: 5.5'			
Casing Diameter: 4"		Drill Rig:			
Drill Co: Apex		Method: Vibracore			
Driller: KIA/Brett		Log By: G Dakota S		Sheet: 1 of 1	
Depth below surface grade (ft)	RQD	Penetration Recovery	Blows per 6' / Drill Min. per Foot	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%	Elevation (MLLW)
				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel.	
0-1				Black Silt Fine Sand, little med. Sand, little gravel Some Silt.	
1-2				Gray Gray Fine Sand, little silt, trace med. Sand,	
2-3				Gray clay, Presumpscot formation -	
				Sample ID: CSP-8	
				Composite with VB-15	
				Reference Sample	
Notes/ Comments:		1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column represent the elevation of the bottom of the respective split-spoon, core run, or drill tool.			
Refusal:					
Elevation of Bedrock:					

Date: 11/11/17

BORING LOG

Project: Portland CAD				Project No: 016-269-00	X:
Location: Proposed CAD location				Y:	
Elevation at grade: Datum: MLLW				Boring No: VB-13	
Casing Type: Steel		Boring Depth: 6.0'			
Casing Diameter: 4"		Drill Rig:			
Drill Co: Apex		Method: Vibrabore			
Driller: KIAS Britt		Log By: G. Daukas		Sheet: 1 of 1	
Depth below surface grade (ft)	RQD	Penetration Recovery	Blows per 6' / Drill Min. per Foot	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%	Elevation (MLLW)
				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel.	
5.5'				Black Silt, trace fine sand, trace medium sand, trace gravel, trace clay. Slight petroleum odor.	
				Sample ID CSP-7	
				No composite.	
				Collected QA/QC Duplicate.	
				Reference Sample	
Notes/ Comments:		1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column represent the elevation of the bottom of the respective split-spoon, core run, or drill tool.			
Refusal:					
Elevation of Bedrock:					

Date: 10/31/17

BORING LOG

Project: Portland CAD		Project No: 016-239-00	X:		
Location: Proposed CAD location		Y:			
Elevation at grade: Datum: MLLW					
Casing Type: Steel	Boring Depth: 6.0'	Boring No: VB-14 Union wharf			
Casing Diameter: 4"	Drill Rig:				
Drill Co: Apex	Method: Vibracore				
Driller: Kias/Brett	Log By: G. Dukas	Sheet: 1 of 1			
Depth below surface grade (ft)	RQD	Penetration Recovery	Blows per 6' / Drill Min. per Foot	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%	Elevation (MLLW)
				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel.	
40'	790	40'		Gray Clay trace silt. Highly plastic. Presumptive clay formation.	
				Composite with VB-13 gp	
				Sample ID CSP-7 gp No composite	
				No Analytical sample collected.	
				Reference Sample	
Notes/ Comments:		1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column represent the elevation of the bottom of the respective split-spoon, core run, or drill tool.			
Refusal:					
Elevation of Bedrock:					

Date: 10/31/17

BORING LOG

Project: Portland CAD				Project No: 0116-089-X	X:
Location: Proposed CAD location				Y:	
Elevation at grade: Datum: MLLW				VB-12	
Casing Type: Steel	Boring Depth: 4.0			Boring No:	
Casing Diameter: 4"	Drill Rig:			Sheet: 1 of 1	
Drill Co: Apex	Method: vibrocore				
Driller: KIAS / Brett	Log By: G. Dautas				
Depth below surface grade (ft)	RQD	Penetration Recovery	Blows per 6' / Drill Min. per Foot	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%	Elevation (MLLW)
				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel.	
3.5'				Black silt little clay trace Fine Sand loose, soft, low plasticity Trace gravel	
				Composite with VB-11	
				Sample ID CSR-6 Time 1330	
				Reference Sample	
Notes/ Comments:		1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column repres the elevation of the bottom of the respective split-spoon, core run, or drill tool.			
Refusal:					
Elevation of Bedrock:					

Date: 10/31/17

BORING LOG

Project: Portland CAD				Project No.: 0116-089-00	X:
Location: Proposed CAD location				Y:	
Elevation at grade: Datum: MLLW				Boring No.: VB-11 knowhere	
Casing Type: Steel		Boring Depth: 4.5'			
Casing Diameter: 4"		Drill Rig:			
Drill Co: Apex		Method: Vibrocore			
Driller: kias/Brett		Log By: G. Daukas		Sheet: 1 of 1	
Depth below surface grade (ft)	RQD	Penetration Recovery	Blows per 6' / Drill Min. per Foot	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%	Elevation (MLLW)
2.5'				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel. Black Fine Sand trace silt, Dense outwash from storm Sewer	
				Composite with VB-12	
				Sample ID CSP-6 Time 13:30	
Notes/ Comments:		1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column repres the elevation of the bottom of the respective split-spoon, core run, or drill tool.			
	Refusal:	4.5'			
	Elevation of Bedrock:				

1/18/18 SP

Date: 1/18/18

BORING LOG

Project: Portland CAD BF		Project No: 0116-289-00		X:
Location: Proposed CAD location East End Public		Y:		
Elevation at grade: Datum: MLLW				
Casing Type: Steel	Boring Depth: 6.0'	Boring No: VB-1		
Casing Diameter: 4"	Drill Rig:			
Drill Co: Apex	Method: Vibracone			
Driller: Kias/Brott	Log By: G. Dautas	Sheet: 1 of 1		
Depth below surface grade (ft)	RQD	Penetration Recovery	Blows per 6' / Drill Min. per Foot	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%
				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel.
				Black moist sand Fine sand trace silt. Clam shells
0-3'				Brown moist sand Little Fine Sand trace silt.
3'-4.2'				Blue gray clay
				Sample CSS-1
				Composite with VB-2
Notes/ Comments:		1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column repres the elevation of the bottom of the respective split-spoon, core run, or drill tool.		
Refusal:		Ref 6'		
Elevation of Bedrock:				
				Elevation (MLLW)

11/13/18 80

Date: 11/13/18

BORING LOG

Project: Portland-CAD BF			Project No: 016-289-A
Location: Proposed CAD location EAST END Commercial			
Elevation at grade: Datum: MLLW			
Casing Type: Steel	Boring Depth: 6'		Boring No: VB-2
Casing Diameter: 4"	Drill Rig:		
Drill Co: Apex	Method: Vibracore		
Driller: Kris Brett	Log By: G. Dankas	Sheet: 1 of 1	
Depth below surface grade (ft)	RQD	Penetration Recovery	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%
			EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel.
0-15			Black Coarse sand trace Fine gravel shells, trace silt
1-5-3.0			Dark Brown medium sand some fine sand. trace silt, shell fragments trace clay
			Sample CSS-1 Time 1310
			Composite with VB-1
Notes/ Comments:		1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column repres the elevation of the bottom of the respective split-spoon, core run, or drill tool.	
Refusal:		3' recovery	
Elevation of Bedrock:			

Date: 1/19/18

BORING LOG

Project: Portland GAD BF				Project No:	X:
Location: Proposed GAD location Amethyst Lot				Y:	
Elevation at grade: Datum: MLLW				Boring No:	VB-3
Casing Type: Steel	Boring Depth: 6.0				
Casing Diameter: 4"	Drill Rig:				
Drill Co: Apex	Method: Vibracore				
Driller: Kins/Bret	Log By: G. Daukas			Sheet: 1 of 1	
Depth below surface grade (ft)	RQD	Penetration Recovery	Blows per 6' / Drill Min. per Foot	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%	Elevation (MLLW)
				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel. 0-3'	
				Black fine sand little silt medium sand trace silt. Shell and organic debris fragments Petroleum odor. Visible Sheen	
			3'-3.2'	med Gravel trace med to fine sand. heavy petroleum	
			3.2-6.0	Same as 0-3'	
				Sample ID - CSR-2	
				Composite with VB-4	
Notes/ Comments:	1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column represent the elevation of the bottom of the respective split-spoon, core run, or drill tool.				
Refusal:	6.0'				
Elevation of Bedrock:					

Date: 1/19/18

BORING LOG

Project: Portland CAD BF

Project No: 0116-28900

X:

Location: Proposed CAD location Amethyst

Y:

Elevation at grade: Datum: MLLW

Casing Type: Steel Boring Depth: 60

Boring No: VB-4

Casing Diameter: 4"

Drill Rig:

Drill Co: Apex

Method: Vibracore

Driller: KIAS/Brett

Log By: G. Daukas

Sheet: 1 of 1

Depth below surface grade (ft)	RQD	Penetration rate Recovery	Blows per foot / Drill Min.	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%	Elevation (MLLW)
				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel.	
0-3				Black soupy medium to coarse sand and gravel, trace silt.	
3-6'				Brown gray medium to coarse sand little fine sand, trace silt. material grading finer with depth.	
				Sample ID CSP-2	
				Composite with VB-3	
Notes/ Comments:	1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column represent the elevation of the bottom of the respective split-spoon, core run, or drill tool.				
Refusal:					
Elevation of Bedrock:					

1/18/18

Date: 1/18/18

BORING LOG

Project: Portland CAD BF Location: Proposed CAD location Breakwater				Project No: 0116 782-00	X:
Elevation at grade: Datum: MLLW				Boring No: VB-29	Y:
Casing Type: Steel Boring Depth:					
Casing Diameter: 4"					
Drill Co: Apex Method: Vibracore					
Driller: Klas/Brett Log By: G. Dakas				Sheet: 1 of 1	
Depth below surface grade (ft)	RQD	Penetration Recovery	Blows per 6' / Drill Min. per Foot	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%	Elevation (MLLW)
				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel.	
				less than 6" of sediment ontop of concrete No Recovery.	
Notes/ Comments: 1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column repres the elevation of the bottom of the respective split-spoon, core run, or drill tool.					
Refusal:					
Elevation of Bedrock:					

1/18/18

Date: 1/18/18

BORING LOG

Project: Portland CAD-BF				Project No: 0116-089-00	X:
Location: Proposed CAD location Port Harbor				Y:	
Elevation at grade: Datum: MLLW					
Casing Type: Steel		Boring Depth: 6'		Boring No: VB-30	
Casing Diameter: 4"		Drill Rig: Vibracore			
Drill Co: Apex		Method:			
Driller: Kinsl/Batt		Log By: G. Dakas		Sheet: 1 of 1	
Depth below surface grade (ft)	RCD	Penetration/ Recovery	Blows per 6' / Drill Min. per Foot	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%	Elevation (MLLW)
				EXAMPLE: Black Organic SILT, trace fine sand, trace fine gravel.	
				Light brown to green brown Fine Sand some Silt.	
				Sample ID CSS-15	
				Composite with VB-29-7D	
				No composite.	
Notes/ Comments:		1). Numbers in "Depth below mudline (ft)" column represent the depth below mudline of the bottom of the respective split-spoon, core run, or drill tool advancement. 2). Numbers in "Elevation (MLLW)" column repres the elevation of the bottom of the respective split-spoon, core run, or drill tool.			
	Refusal:	Recovery 6'			
	Elevation of Bedrock:				

Appendix E (Available upon request)

Apex Vibracore SOP

Appendix F (Available upon request)

Eelgrass Survey Report

Lobster Survey Report

Appendix G (Available upon request)

Cultural and Historic Resources Response Letters

Appendix H (Available upon request)

Dredge Volumes

Appendix I (Available upon request)

Data Quality Review

Appendix J
Analytical Results

Polycyclic Aromatic Hydrocarbons (PAHs)
Portland Harbor Preliminary Summary Report

		East End Beach		Amethyst Lot		Maine State Pier/Ocean Gateway		Maine Wharf		Portland Pier		Chandler's Wharf		Union Wharf		Wright Wharf		Holyoke Wharf		Deake's Wharf		Portland Yacht Services		Ricker's Wharf		South Port Marina		Aspasia/Sunset Marina		Port Harbor/Breakwater Marina			
		CSP-1		CSP-2		CSP-3		CSP-4		CSP-5		CSP-6		CSP-7D		CSP-8		CSP-9		CSP-10		CSP-11		CSP-12		CSP-13		CSP-14		CSP-15			
PARAMETER_NAME	ug/kg	MEDEP Value ₁	Result	CSP-1	CSP-2	Result	CSP-3	Result	CSP-4	CSP-5	Result	CSP-6	CSP-7D	Result	CSP-8	Result	CSP-9	CSP-10	Result	CSP-11	Result	CSP-12	Result	CSP-13	Result	CSP-14	Result	CSP-15					
ACENAPHTHENE	48,000,000	3.24	U	54,400		521		367		1,150		948		1,580		1,660		28,800		1,600		132		4,170		75.7		34		15.6		4.1	J
ACENAPHTHYLENE	48,000,000	3.24	U	386		456		223		956		218		1,360		655		4,220		1,920		50.8		288		65.1		190		70		12.2	
ANTHRACENE	100,000,000	6.28	J	16,600		1,550		765		2,440		1,160		4,990		4,300		62,000		4,250		429		1,190		135		148		58.2		25.9	
BENZ(A)ANTHRACENE	1,700,000	14.4		10,300		3,100		2,700		7,140		5,750		11,800		7,380		85,200		9,560		678		1,880		605		608		166		86.1	
BENZO(A)PYRENE	9,900	14.2		3,500		3,270		2,480		6,640		5,840		10,400		7,440		88,600		7,810		566		1,280		627		736		204		83.4	
BENZO(B)FLUORANTHENE	1,700,000	14.8		3,740		2,790		2,610		6,680		5,850		8,930		6,480		79,600		7,240		567		1,640		726		960		174		82.5	
BENZO(GHI)PERYLENE	72,000,000	9.51		965		1,780		1,310		4,140		3,800		5,480		4,330		54,200		4,710		311		676		451		606		142		52.7	
BENZO(K)FLUORANTHENE	17,000,000	12.5		3,240		1,840		1,400		4,640		5,100		7,980		6,130		57,100		4,890		355		870		538		494		165		81.5	
CHRYSENE	100,000,000	13.8		8,170		3,200		2,370		6,070		6,850		9,090		7,210		87,300		8,300		611		1,630		684		701		184		81.6	
DIBENZ(A,H)ANTHRACENE	170,000	3.24	U	346		609		436		1,360		986		1,940		1,480		12,100		1,470		115		235		92.9		164		44.4		10.4	
FLUORANTHENE	24,000,000	31.7		61,400		5,780		5,630		14,200		13,700		23,100		18,200		235,000		19,600		1,370		8,130		1,390		1,290		298		117	
FLUORENE	96,000,000	3.44	J	56,000		632		543		1,310		1,130		2,220		1,820		29,900		1,450		193		4,260		106		42.6		17.2		6.53	J
INDENO(1,2,3-CD)PYRENE	1,700,000	9.32		976		2,160		1,490		4,260		4,160		6,720		4,850		59,600		4,910		366		815		465		624		147		52.3	
NAPHTHALENE	130,000	3.24	U	6,160		338		594		1,010		1,800		2,920		1,010		31,100		1,750		129		1,120		121		69.5		34.9		12.6	
PHENANTHRENE	72,000,000	26.8		145,000		4,260		3,960		10,600		9,540		14,000		14,800		258,000		14,500		1,380		11,100		852		569		162		58.1	
PYRENE	72,000,000	32.6		36,200		6,250		4,530		15,000		11,100		19,600		12,500		184,000		17,600		1,100		6,370		1,230		1,200		328		144	

All results in micrograms per kilogram (ug/kg)

1. Soil Construction Worker soil exposure scenario in MEDEP's Maine Remedial Action Guidelines (RAGs) for Sites Contaminated with Hazardous Substances dated October 19, 2018. ug/kg

RED-Exceedance of MEDEP Construction Worker Value

U - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses. Value reported is the MDL

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

I - The lower value for the two columns has been reported due to obvious interference

P - The RPD between the results for the two columns exceeds the method-specified c

Metals
Portland Harbor Preliminary Assessment Report

		East End Beach		Amethyst Lot		Maine State Pier/Ocean Gateway		Maine Wharf		Portland Pier		Chandler's Wharf		Union Wharf		Wright Wharf		Holyoke Wharf		Deake's Wharf		Portland Yacht Services		Ricker's Wharf		South Port Marina		Aspasia/Sunset Marina		Port Harbor/Breakwater Marina				
		CSP-1		CSP-2		CSP-3		CSP-4		CSP-5		CSP-6		CSP-7		CSP-8		CSP-9		CSP-10		CSP-11		CSP-12		CSP-13		CSP-14		CSP-15				
PARAMETER_NAME	MEDEP Value _i	mg/kg	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual				
ARSENIC, TOTAL		54	7.32		7.44		12.2		10.8		23.9		3.84		18.6		28		8.07		14.8		6.2		8.55		10.7		14.7		7.78		4.51	
CADMIUM, TOTAL		42	0.151		0.496		0.615		1.04		4.21		0.261		2.51		2.25		1.53		1.47		0.136		1.91		0.221		0.263		0.19		0.235	
CHROMIUM, TOTAL		27,000	25.6		23.9		63.2		27		136		18.6		51.2		72.4		23.7		52.3		23.8		43.2		26.7		48		23.3		18.2	
COPPER, TOTAL		3,400	7.34		26.8		68.4		77.6		318		50.5		174		267		78.1		192		14.5		155		23.5		56.1		21.1		9.44	
MERCURY, TOTAL		3.1	0.015		0.625		0.334		0.744		3.04		0.651		4.16		1.47		1.13		7.82		0.041		0.572		0.121		0.567		0.211		0.278	
NICKEL, TOTAL		990	15.2		15.4		21.5		17		29.8		12.6		26.9		41.5		16.9		25.3		14.2		24.6		15.5		27.8		14.3		10.9	
LEAD, TOTAL		450	6.08		71		84.2		420		1430		67.7		780		855		369		546		17		195		50.7		80.5		19.4		17.1	
ZINC, TOTAL		100,000	35.7		75		153		283		1480		102		746		525		388		544		43		291		79.9		136		52.4		34.8	

All results in milligrams per kilogram (mg/kg)

1. Soil Construction Worker soil exposure scenario in MEDEP's Maine Remedial Action Guidelines (RAGs) for Sites Contaminated with Hazardous Substances dated October 19, 2018

RED-Exceedance of MEDEP Construction Worker Value

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I - The lower value for the two columns has been reported due to obvious interference.

P - The RPD between the results for the two columns exceeds the method-specified criteria..

Polychlorinated Biphenyls (PCBs)
Portland Harbor Preliminary Summary Report

	ug/kg	East End Beach	Amethyst Lot	Maine State Pier/Ocean Gateway	Maine Wharf	Portland Pier	Chandler's Wharf	Union Wharf	Union Wharf	Wright Wharf	Holyoke Wharf	Deake's Wharf	Portland Yacht Services	Ricker's Wharf	South Port Marina	Aspasia/Sunset Marina	Port Harbor/Breakwater Marina	
PARAMETER_NAME	MEDEP Value ₁	CSP-1	CSP-2	CSP-3	CSP-4	CSP-5	CSP-6	CSP-7	CSP-7D	CSP-8	CSP-9	CSP-10	CSP-11	CSP-12	CSP-13	CSP-14	CSP-15	
		Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	
CL2-BZ#8		0.324	U	0.449	U	0.461	U	0.408	U	0.53	U	0.562	U	0.462	U	0.507	U	38.9
CL3-BZ#18		0.324	U	0.449	U	0.461	U	0.408	U	0.53	U	0.562	U	0.462	U	0.507	U	38.9
CL3-BZ#28		0.324	U	0.449	U	0.461	U	0.408	U	0.53	U	0.562	U	12		0.507	U	38.9
CL4-BZ#44		0.324	U	0.449	U	4.37		0.408	U	30.2		0.562	U	0.462	U	0.507	U	38.9
CL4-BZ#49		0.324	U	0.449	U	0.461	U	0.408	U	0.53	U	0.562	U	0.462	U	0.507	U	38.9
CL4-BZ#52		0.324	U	0.449	U	10.4		48.1		0.53	U	0.562	U	0.462	U	0.507	U	38.9
CL4-BZ#66		0.324	U	0.449	U	1.88		0.408	U	0.53	U	0.562	U	0.462	U	0.507	U	38.9
CL5-BZ#87		0.324	U	0.449	U	3.63		0.408	U	7.26		0.562	U	0.462	U	0.507	U	38.9
CL5-BZ#101		0.324	U	0.449	U	7.67		0.408	U	32.9		2.68		8.41		0.507	U	38.9
CL5-BZ#105		0.324	U	0.449	U	0.461	U	0.408	U	7.76		0.562	U	0.462	U	0.507	U	38.9
CL5-BZ#118		0.324	U	0.449	U	0.461	U	9.49		31		2.51		12.6		0.507	U	38.9
CL6-BZ#128		0.324	U	0.449	U	2.94		3.27		7.68		0.562	U	0.462	U	11.6		38.9
CL6-BZ#138		0.324	U	0.449	U	8.82		20.4		50.8		6.31		14.8		39.6		38.9
CL6-BZ#153		0.324	U	0.449	U	5.23		8.44		22.2		4.82		13.1		28		38.9
CL7-BZ#170		0.324	U	0.449	U	0.461	U	0.408	U	0.53	U	0.562	U	0.462	U	8.62		38.9
CL7-BZ#180		0.324	U	0.449	U	2.42		4.68		17.4		3.77		11.7		22.7		38.9
CL7-BZ#183		0.324	U	0.449	U	0.461	U	1.26		3.72		0.723	J	2.72		5.68		38.9
CL7-BZ#184		0.324	U	0.449	U	0.461	U	0.408	U			0.562	U	0.462	U	0.507	U	38.9
CL7-BZ#187		0.324	U	0.449	U	0.461	U	3.32		11.4		3.28		8.79		15.4		38.9
CL8-BZ#195		0.324	U	0.449	U	0.461	U	0.408	U	0.53	U	0.562	U	0.462	U	0.507	U	38.9
CL9-BZ#206		0.324	U	0.449	U	0.461	U	4.22		7.3		0.562	U	9.08		6.69		38.9
CL10-BZ#209		0.324	U	0.449	U	0.461	U	3.96		6.58		0.562	U	14.4		6.25		38.9
Total PCB's ^c	74,000	5.832	8.082	92.07	215.432	454.15	53.484	213.918		282.79		700.2		148.77		5.976	436.868	13.113
																	33.684	6.624
																	7.447	

All results in micrograms per kilogram (ug/kg)

1. Soil Construction Worker soil exposure scenario in MEDEP's Maine Remedial Action Guidelines (RAGs) for Sites Contaminated with Hazardous Substances dated October 19, 2018. ug/Kg

2. Total PCBs are the sum of the concentrations of the 18 congeners in ***bold italics*** multiplied by two, half the detection limits is used for non-detects, based on NOAA (1993), 8082A

RED-Exceedance of MEDEP Construction Worker Value

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J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

I - The lower value for the two columns has been reported due to obvious inter-

P - The RPD between the results for the two columns exceeds the method-spe

Pesticides
Portland Harbor Preliminary Summary Report

PARAMETER_NAME	ug/kg	East End Beach		Amethyst Lot		Maine State Pier/Ocean Gateway		Maine Wharf		Portland Pier		Chandler's Wharf		Union Wharf		Union Wharf		Wright Wharf		Holyoke Wharf		Deake's Wharf		Portland Yacht Services		Ricker's Wharf		Aspasia/Sunset Marina		Port Harbor/Breakwater Marina	
		CSP-1		CSP-2		CSP-3		CSP-4		CSP-5		CSP-6		CSP-7		CSP-7D		CSP-8		CSP-9		CSP-10		CSP-11		CSP-12		CSP-14		CSP-15	
		MEDEP Value ¹	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	
4,4'-DDD	7,700	0.324	U	0.449	U	110	P	87		252		1.12	U	29.2		30.9		197		53.7		0.332	U	161		1.83		1.91		0.751	
4,4'-DDE	100,000	0.324	U	0.449	U	6.25		8.23		46.9	P	1.12	U	18.7		13		60	P	25.8		0.332	U	19.4		1.41		0.536		0.366	U
4,4'-DDT	160,000	0.324	U	0.449	U	40.9	IP	3.43	IP	8.07	IP	1.12	U	16	I	5.37	IP	13.5		0.561	U	0.332	U	4.06	IP	0.729	IP	0.492	IP	0.744	P
ALDRIN	14,000	0.324	U	0.449	U	0.461	U	0.408	U	1.06	U	1.12	U	2.31	U	2.54	U	1.94	U	0.561	U	0.332	U	0.502	U	0.423	U	0.368	U	0.366	U
CIS-CHLORDANE	100,000	0.324	U	0.449	U	0.634		1.33		6.97		1.12	U	2.31	U	3.19	P	1.94	U	1.9		0.332	U	5.4	P	0.423	U	0.368	U	0.366	U
CIS-NONACHLOR		0.324	U	0.449	U	0.461	U	0.408	U	1.06	U	1.12	U	2.31	U	2.54	U	1.94	U	0.561	U	0.332	U	0.502	U	0.423	U	0.368	U	0.366	U
DIELDRIN	12,000	0.324	U	0.449	U	0.461	U	0.408	U	1.06	U	1.12	U	2.31	U	2.54	U	1.94	U	0.561	U	0.332	U	0.502	U	0.423	U	0.368	U	0.366	U
ENDOSULFAN I	1,700,000	0.324	U	0.449	U	0.461	U	0.408	U	1.06	U	1.12	U	2.31	U	2.54	U	1.94	U	0.561	U	0.332	U	0.502	U	0.423	U	0.368	U	0.366	U
ENDOSULFAN II	1,700,000	0.324	U	0.449	U	0.461	U	0.408	U	1.06	U	1.12	U	2.31	U	2.54	U	1.94	U	0.561	U	0.332	U	0.502	U	0.423	U	0.368	U	0.366	U
ENDRIN	510,000	0.324	U	0.449	U	0.461	U	0.408	U	1.06	U	1.12	U	2.31	U	2.54	U	1.94	U	0.561	U	0.332	U	0.502	U	0.423	U	0.368	U	0.366	U
GAMMA-BHC	3,000	0.324	U	0.449	U	0.461	U	0.408	U	1.06	U	1.12	U	2.31	U	2.54	U	1.94	U	0.561	U	0.332	U	0.502	U	0.423	U	0.368	U	0.366	U
HEPTACHLOR	34,000	0.324	U	0.449	U	0.461	U	0.408	U	1.06	U	1.12	U	2.31	U	2.54	U	1.94	U	0.561	U	0.332	U	0.502	U	0.423	U	0.368	U	0.366	U
HEPTACHLOR EPOXIDE	4,400	0.648	U	0.898	U	0.923	U	0.817	U	2.12	U	2.25	U	4.62	U	5.07	U	3.89	U	1.12	U	0.663	U	1	U	0.846	U	0.737	U	0.733	U
HEXAChlorobenzene	3,400	0.648	U	0.898	U	0.923	U	0.817	U	2.12	U	2.25	U	4.62	U	5.07	U	3.89	U	1.12	U	0.663	U	1	U	0.846	U	0.737	U	0.733	U
METHOXYCHLOR	1,300,000	3.24	U	4.49	U	4.61	U	4.08	U	10.6	U	11.2	U	23.1	U	25.4	U	19.4	U	5.61	U	3.32	U	5.02	U	4.23	U	3.68	U	3.66	U
OXYCHLORDANE		0.648	U	0.898	U	0.923	U	0.817	U	2.12	U	2.25	U	4.62	U	5.07	U	3.89	U	1.12	U	0.663	U	1	U	0.846	U	0.737	U	0.733	U
TOXAPHENE																															
TRANS-CHLORDANE		0.324	U	0.449	U	0.461	U	0.408	U	1.06	U	1.12	U	2.31	U	2.54	U	1.94	U	0.561	U	0.332	U	0.502	U	0.423	U	0.368	U	0.366	U
TRANS-NONACHLOR		0.324	U	0.449	U	0.461	U	0.408	U	11.5		1.12	U	2.31	U	2.54	U	1.94	U	0.561	U	0.332	U	0.678	IP	0.423	U	0.368	U	0.366	U

All results in micrograms per kilogram (ug/kg)

1. Soil Construction Worker soil exposure scenario in MEDEP's Maine Remedial Action Guidelines (RAGs) for Sites Contaminated with Hazardous Substances dated October 19, 2018. ug/kg

RED-Exceedance of MEDEP Construction Worker Value

U - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses. Value reported is the MDL

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

I - The lower value for the two columns has been reported due to obvious interference.

P - The RPD between the results for the two columns exceeds the method-specified criteria..

**Grain Size and Total Organic Carbon
Portland Harbor Preliminary Summary Report**

East End Beach		Amethyst Lot		Maine State Pier/Ocean Gateway		Maine Wharf		Portland Pier		Chandler's Wharf		Union Wharf		Wright Wharf		Holyoke Wharf		Deake's Wharf		Portland Yacht Services		Ricker's Wharf		South Port Marina		Aspasia/Sunset Marina		Port Harbor/Breakwater Marina	
CSP-1	CSP-2	CSP-3	CSP-4	CSP-5	CSP-6	CSP-7	CSP-7D	CSP-8	CSP-9	CSP-10	CSP-11	CSP-12	CSP-13	CSP-14	CSP-15	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	
PARAMETER_NAME																													
% COARSE SAND	5.6	11.3	22.1	5.2	26	9.6	14.9	18.5	7.3	14.6	3.6	18.4	7.5	21.6	7.1												3.6		
% FINE SAND	45.7	27.3	14.1	36.8	11.6	25.3	20.5	16.9	30.3	22.5	37.1	18.2	33	16.9	35.3												41.6		
% MEDIUM SAND	19.1	35.2	46.3	24.7	26.9	40.2	25.9	32.2	27.5	32.9	32.6	33.1	23.9	22.5	26.5												13.3		
%FINES	26.2	25	11.7	28.9	15.2	23.2	37.7	28.8	31.7	14	25.8	30.3	29.3	37	27.3	41.3													
%GRAVEL	3.4	1.2	5.8	4.4	20.3	1.7	1	3.6	3.2	16	0.9	0	6.3	2	3.8											0.2			
% Moisture	25.8	47	50.3	41.7	55.6	17.2	48.9	53.3	37.9	55.9	27.3	51.8	44.7	58.6	36.3											36.5			
%Total Solids	74.2	53	49.7	58.3	44.4	82.8	51.1	46.7	62.1	44.1	72.7	48.2	55.3	41.4	63.7	63.5													
%Total organic carbon	0.515	2.64	2.785	8.56	10.485	1.605	7.935	7.235	8.775	8.19	0.649	3.145	2.59	2.68	1.285	1.04													

TOC = average of 2 replication samples.
All grain-size results in percent by volume

Turner's Island Sediment Analytical Data

Normalized Pollutant Concentrations

Turners Island

NAE-2015-00601

Sample Site Metals (ppm)	FNP Portland Composite 2							
	T 1-2 Composite				T 3-4 Composite			
	value	Raw Data	Qualifier	Compare	Raw Data	Qualifier	Compare	
Arsenic	14	11	OK	0.79	12	OK	0.86	
Cadmium	1.07	0.55	OK	0.51	1.1	*	1.03	
Chromium	52	48	OK	0.92	59	*	1.13	
Copper	40	43	*	1.08	57	*	1.43	
Mercury	0.5	0.48	OK	0.96	0.6	*	1.20	
Nickel	31	28	OK	0.90	38	*	1.23	
Lead	68	65	OK	0.96	93	*	1.37	
Zinc	150	120	OK	0.80	130	OK	0.87	
% fines			*					
PAHs (ppb)								
Fluorene	130	74	25.965	OK	0.2	64	23.273	OK
Phenanthrene	1100	580	203.509	OK	0.2	420	152.727	OK
Anthracene	460	210	73.684	OK	0.2	180	65.455	OK
Naphthalene	130	48	16.842	OK	0.1	61	22.182	OK
Acenaphthylene	340	190	66.667	OK	0.2	140	50.909	OK
Acenaphthene	120	32	11.228	OK	0.1	26	9.455	OK
Fluoranthene	2400	1200	421.053	OK	0.2	920	334.545	OK
Pyrene	3300	1300	456.140	OK	0.1	1100	400.000	OK
Benzo(a)anthracene	1500	830	291.228	OK	0.2	560	203.636	OK
Chrysene	1600	790	277.193	OK	0.2	640	232.727	OK
Total Benzofluoranthenes	2600	1180	414.035	OK	0.2	1050	381.818	OK
Benzo(a)pyrene	1600	760	266.667	OK	0.2	580	210.909	OK
Dibenzo(a,h)anthracene	200	130	45.614	OK	0.2	67	24.364	OK
Benzo(g,h,i)perylene	870	370	129.825	OK	0.1	210	76.364	OK
Indeno(123-cd)pyrene	880	340	119.298	OK	0.1	210	76.364	OK
TOC (%)	0.673	2.85			2.75			
Sum of PAH's	17230	8034			6228			

* = > MEAN + 2SD

ok = < MEAN + 2SD