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Subject: Work Plan Addendum No. 4 for Additional Marine Area Sediment Sample Collection and Analysis at the Weyerhaeuser Mill A Former Site, Everett, Washington

This memorandum provides an addendum to the Weyerhaeuser Mill A Former Remedial Investigation/ Feasibility Study (RI/FS) Work Plan (GeoEngineers 2014a) and Marine Area Sampling and Analysis Plan (SAP; GeoEngineers 2014b) for the Weyerhaeuser Mill A Former Site (Site). This addendum is being provided on behalf of the Port of Everett (Port) and describes additional sediment sample collection for chemical analysis at the Site. This addendum has been prepared to supplement and meet the RI requirements specified in the RI/FS Work Plan.

The sample collection and analysis described in this addendum is being performed as follow-up to the initial Marine Area sediment investigation performed in October/November 2015 and supplemental sediment investigation completed under RI/FS Work Plan Addendum No. 1 (GeoEngineers 2016). The additional sample collection and analysis is based on the results of initial and supplemental sediment sampling and analysis, the Port’s proposed South Terminal maintenance dredging project, and associated communication and coordination with the Washington State Department of Ecology (Ecology). The primary communications related to this work include the following:

- Marine Area Remedial Investigation Data Report Technical Memorandum, Weyerhaeuser Mill A Former, Everett, Washington, dated November 7, 2017 (GeoEngineers 2017).
- Email presenting the Proposal for Additional Marine Area Sampling dated July 7, 2018.
- A meeting between representatives of Ecology, Port of Everett, Weyerhaeuser Company and Washington State Department of Natural Resources (DNR) held on July 11, 2018.
- Email from Ecology dated July 19, 2018 providing the response to discussion of sediment data gaps and the Proposal for Additional Marine Area Sampling during the July 11 meeting.

The sediment sample collection and analysis described in this addendum includes the collection of surface and subsurface samples from seven new locations for conventional and chemical analysis to evaluate compliance with benthic and human health chemical criteria in the Berth 1 Wharf area at the South Terminal.



BACKGROUND

Marine Area Investigation and Data Gap Evaluation

Between October 2015 and September 2016, sediment samples were collected to characterize the nature and extent of contamination within the Marine Area of the Site in accordance with the RI/FS Work Plan. In consultation with Ecology, selected surface and subsurface sediment samples collected as part of the initial investigation (i.e., archived sample analyses) and supplemental investigations were submitted for chemical analysis and bioassay testing to further evaluate the nature and extent of specific contaminants and to further evaluate the potential impacts to benthic organisms.

The results of the Marine Area investigation identified metals, semi-volatile organic compounds (SVOCs), carcinogenic polycyclic aromatic hydrocarbons (cPAHs), polychlorinated biphenyls (PCBs), and dioxins and furans in surface and subsurface sediment at concentrations exceeding the preliminary screening levels (PSLs) for the protection of benthic organisms and human health and higher trophic level ecological receptors. In addition, wood debris comprised of sawdust, chips, bark, twigs and fibers was identified in the nearshore area between the Berth 1 Wharf at the South Terminal and the Pacific Terminal.

An evaluation of contaminant concentrations in sediment in comparison to PSLs was completed for the Marine Area and documented in the Mill A Marine Area Data Report Technical Memorandum dated December 5, 2017. Subsequent to the submittal of the Marine Area Data Report Technical Memorandum, it was identified that additional data was needed to characterize the nature and extent of contamination and to identify and evaluate remedial alternatives in the Berth 1 Wharf area where there is the current and future potential for sediment disturbance as a result of vessel operations. Figures 1 through 3 summarize the existing chemical results in surface sediment, subsurface recent deposits and underlying historical deposits compared to the PSLs for protection of benthic organisms in the vicinity of the Berth 1 Wharf. Figures 4 through 6 summarize the existing chemical results for surface sediment, subsurface recent deposits and underlying historical deposits compared to the PSLs for protection of human health and higher trophic level ecological receptors in the vicinity of the Berth 1 Wharf.

Recent deposits are generally comprised of unconsolidated brown to grey silt with varying sand, gravel and contain varying amounts wood debris (i.e., saw dust, wood chips, bark, and twigs). In the offshore area northwest and southwest of South Terminal, recent deposits are approximately 2 feet in thickness which generally correspond to approximately 60 to 100 years of sediment deposition based on calculated sedimentation rates for the Marine Area¹. In the nearshore area north of the South Terminal, recent deposits containing up to 21 feet thick of buried wood placed during historical expansion of the shoreline during wood milling activities has been identified. With increased distance from the shoreline, recent deposits containing buried wood generally decrease in thickness. Similarly, the quantity of observed wood debris also decreases with distance from the shoreline to less than 1 percent in the offshore area. Underlying the recent deposits are historical sediment deposits sourcing from the Snohomish basin. Snohomish basin deposits which generally consist of consolidated gray silt with varying sand content that were deposited prior to area-wide industrial development that began in the early 1900s.

¹ Sedimentation rates range between 0.59 cm/year and 1.65 cm/year based on the results of a geochronology study completed for the Site (GeoEngineers, 2018)

ADDITIONAL SEDIMENT SAMPLING AND ANALYSIS

Additional sediment sampling and analysis is being proposed to further define the nature and extent of contamination in surface and subsurface sediment adjacent to the Berth 1 Wharf area in consideration of the proposed maintenance dredging to support current and future Site use. Based on the existing sediment data, one or more Site contaminants including, wood debris, metals, SVOCs including cPAHs, PCBs and dioxins and furans were detected in surface and subsurface sediment exceeding preliminary screening levels for the protection of benthic organisms (Figures 1 through 3) and/or for the protection of human health and higher trophic level ecological receptors (Figures 4 through 6) in the Berth 1 Wharf Area. Additional sediment samples are being proposed to further characterize surface (0 to 10 cm) sediment, recent sediment deposits (unconsolidated silt and sand with variable wood content) and underlying historical sediment deposits adjacent to the proposed Berth 1 Wharf area and maintenance dredge prism (further discussed below). Sample results will also be used to further support feasibility study development, cleanup action planning, and selection of a preferred remedial alternative for addressing Marine Area contamination in active terminal area with consideration for future terminal expansion to accommodate larger vessels and over-sized cargo that is anticipated by the Port.

The proposed sample locations are shown on Figures 1 through 6. Table 1 summarizes the target sampling locations and intervals for chemical analysis. Sample locations and intervals were selected based on the results of previous investigations and in consultation with Ecology to fill sediment data gaps in the Berth 1 Wharf area. Sediment sampling and analysis will be performed in accordance with the Ecology-approved Marine Area SAP (GeoEngineers 2014). The sediment sample collection and analysis that will be completed as part of the additional sediment investigation identified in this addendum is summarized in the following sections.

Sample Collection and Processing

Sediment samples will be obtained using a grab-type sampler (Van Veen or similar) and by sediment coring (vibracore, hollow-stem auger, sonic drilling, or other method) deployed from a vessel. Surface samples will be obtained from the upper 10 centimeters of sediment. Continuous cores will be advanced through the sediment to depths ranging from approximately 8 to 12 feet below the mudline elevation.

Upon collection, the material recovered in each grab sample and core interval will be photographed and classified in accordance with the Unified Soil Classification System (ASTM 1998). In addition, the absence or presence of wood debris will be recorded on a log of exploration form (i.e., field form). If wood debris is present, the type or types of wood debris (i.e., saw dust, bark, chips, chunks, twigs, fibers, etc.) and estimated quantity (i.e., observed percent by volume) of each wood type will be recorded.

After classifying and photographing the recovered surface sediment/sediment core material, samples from each interval will be placed into a decontaminated stainless-steel bowl and homogenized to a uniform color and texture. The homogenized sample material will then be placed in the sample containers identified in Table 2. Surface sediment samples for porewater analysis (i.e., ammonia and sulfide) will be collected immediately after sample collection and placed into designated sample containers prior to classification or homogenization.

Specific procedures that will be followed as part of this sediment investigation, including vessel positioning, decontamination, sample processing and field documentation are detailed in the Ecology-approved Marine Area SAP.

Laboratory Analysis

Sediment samples will be submitted to Analytical Resources Inc. (ARI) of Tukwila, Washington, for chemical analysis. Table 1 identifies the initial sample locations, target sample horizons and laboratory analysis that will be performed to fill data gaps in the nature and extent of contamination in surface and subsurface sediment at the Berth 1 Wharf area. Table 2 summarizes the analytical methods, sample size, containers, preservation and holding times for laboratory analysis. Sufficient material (minimum of two liters) will be collected from each sample interval (initial or archived sample) to perform each of the listed analysis in accordance with the RI/FS Work Plan and Marine Area SAP. Selected sediment samples identified in Table 1 will be initially submitted for a combination of the following:

- Total organic carbon (TOC) by Puget Sound Estuary Program (PSEP) 1986;
- Total volatile solids (TVS) by PSEP 1986/ standard method (SM) 2540G;
- Total solids (TS) by PSEP 1986/ SM 2540G;
- Ammonia in porewater by EPA 350.1M/SM 4500-NH3;
- Bulk ammonia by EPA 350.3/ SM 4500-NH3;
- Sulfides in porewater by EPA 376.2/SM 4500-S2;
- Bulk sulfides by EPA 376.2/SM 4500-S2;
- Sediment Management Standard (SMS) Metals by United States Environmental Protection Agency (EPA) Method 6000/7000 series;
- SMS Semi-volatile organic compounds (SVOCs) by EPA Method 8270/SIM;
- Polychlorinated Biphenyl (PCBs) congeners by EPA Method 1668A; and
- Dioxins/Furans by EPA Method 1613.

The extraction of porewater from sediment samples for analysis will be performed by the laboratory (ammonia and sulfides) in accordance with Dredged Material Management Program (DMMP) procedures (Hoffman 1998). The lab will also measure pH of the extracted porewater using Method SM 4500-H.

Sediment samples may also be submitted for additional chemical analysis to further evaluate the nature and extent of contamination in the Marine Area based on the results of the South Terminal maintenance dredge material characterization that will be completed under a DMMP-approved Sampling and Analysis Plan. If elected by the Port or required by Ecology. Follow-up analytes may include, but are not limited to the following DMMP parameters:

- Bulk Tributyltin Ion by EPA Method 8270D-SIM/Krone 1989;
- Pesticides by EPA Method 8081B; and
- Herbicides by EPA Method 8151.

Samples not initially submitted for physical and chemical analysis will be archived at ARI for potential follow-up analysis. The results from the initial sediment investigation compared to the PSLs for protection of benthic organisms and human health and higher trophic level ecological receptors and from the South Terminal

maintenance dredge material characterization compared to the DMMP guideline values for open-water disposal and beneficial reuse will be used to identify where additional analyses of archived samples is needed to further define the extent of contamination. Determination of the follow-up laboratory analyses of archived samples will be in consultation with Ecology.

DATA QUALITY OBJECTIVES

The specific data quality objectives (DQOs) for sediment sampling and analysis are detailed in the Ecology-approved Marine Area SAP. An EPA-defined Stage 2B validation will be performed on organic and inorganic analytical data in general accordance with EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (EPA 2004) and EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (EPA 2008). An EPA-Stage 4 validation will be performed for dioxin and furan analytical data. Data packages will be checked for completeness immediately upon receipt from the laboratory to ensure that data and QA/QC information requested are present. At a minimum, the following items will be reviewed to verify the data as applicable:

- Data Package Completeness
- Chain-of-Custody Documentation
- Holding Times and Sample Preservation
- Surrogate Recoveries
- Method Blanks
- Matrix Spikes/Matrix Spike Duplicates
- Laboratory Control Samples/Laboratory Control Sample Duplicates
- Laboratory and Field Duplicates
- Initial Calibrations (ICALs)
- Continuing Calibrations (CCALs)
- Internal Standards
- Instrument Tunes
- Reporting Limits

REPORTING

Upon completion, sediment sampling activities and laboratory results will be transmitted to Ecology to confirm that data gaps have been filled prior to completion and submittal of the RI/FS. The complete RI data set will be presented in the RI/FS report. Chemical analytical data for sediment samples will be submitted to Ecology in electronic format in accordance with Ecology's Environmental Information Management (EIM) Policy 840 following review and validation.



SCHEDULE

The additional sediment sampling and analysis described in this addendum will be performed following Ecology approval of this Work Plan addendum. The additional sediment sampling described in this addendum is anticipated to be performed in conjunction with the dredged material characterization activities proposed for the Berth 1 Wharf at the South Terminal in late-summer/early-fall of 2018 as described in the following section.

South Terminal Maintenance Dredging Project

In addition to the sampling and analysis described above to fill sediment data gaps in the Berth 1 Wharf area, the Port is currently in the process of planning and permitting maintenance dredging adjacent to the Berth 1 Wharf to improve vessel navigation at the South Terminal. Figures 1 through 6 include the proposed dredge area boundary.

The proposed dredging project will remove sediment to a target elevation of -40 feet mean lower low water (MLLW) plus a 1-foot overdredge allowance to provide improved navigation for larger vessels and over-sized cargo that is anticipated by the Port. From the base of the navigation area (i.e., -40 feet MLLW), a transition slope will be constructed at approximately 2.5H:1V (horizontal to vertical) to meet the existing elevations along the southeastern portion of the dredge cut. To evaluate sediment within the proposed dredge prism for the open-water disposal/beneficial reuse suitability determination, the Port has prepared a separate SAP in accordance with the Dredge Material Management Program (DMMP) for review and approval by the Dredged Material Management Office (DMMO) (GeoEngineers 2018).

Material that is determined to be contaminated (i.e., dredged material not suitable for open-water disposal or beneficial reuse), if found as part of the DMMP characterization study, will be removed as a Model Toxics Control Act (MTCA) Interim Cleanup Action (Interim Action) under the authority of Ecology to expedite part of the environmental cleanup for the Marine Area portion Site². Due to the potential for exposed contamination and/or wood debris at the base of the proposed dredge prism or transition slope extending from the base of the proposed dredge cut, discrete 2-foot Z-layer samples will be collected for laboratory analysis at multiple locations across the prism to evaluate the exposed surface. The results of the Z-layer samples will be used to assist in the evaluation for and design of environmental protections to isolate potential wood debris or residual contamination if exposed by dredging and confirm compliance with the State antidegradation policy per DMMP guidance. Additional dredging may be identified by Ecology based on the sediment characterization results and technical/regulatory analysis of the need for further removal to address contamination if it is identified. Environmental protections for the containment of exposed contamination (if necessary) will be determined as part of the Interim Action Work Plan that would be submitted for Ecology approval.

Currently, the maintenance dredge project is anticipated to be implemented during the 2019/2020 in-water work window, pending permit approvals. Characterization the dredge prism will be completed following DMMO review and approval of the DMMP Sampling and Analysis Plan and is anticipated for late-summer or early-fall of 2018.

² A recent Interim Action was completed for the Weyerhaeuser Mill A Former Site Marine Area following dredged material characterization activities for Pacific Terminal. Sample results collected during the dredged material characterization study were used to define the nature and extent of contamination within the dredge prism and evaluate the surface exposed by the dredge cut. Based on the results of the investigation, sloop armoring was utilized to cap and contain residual sediment contamination remaining in-place.



REFERENCES

- GeoEngineers 2018. Draft Dredged Material Characterization Sampling and Analysis Plan, South Terminal Maintenance Dredge Project, Weyerhaeuser Mill A Former Site, Everett, Washington, Prepared for the Dredged Material management Office on behalf of the Port of Everett, July 18, 2018.
- GeoEngineers 2017. Draft Mill A Marine Area Data Report Technical Memorandum, Weyerhaeuser Mill A Former, Everett, Washington, Ecology Agreed Order No. DE 8979. Prepared for the Washington Department of Ecology on behalf of the Port of Everett, Weyerhaeuser Company, and Washington State Department of Natural Resources. December 5, 2017.
- GeoEngineers 2016. Work Plan Addendum No. 1 for Follow-up Sample Collection and Testing at the Former Mill A Marine Area, Everett, Washington. Prepared for the Washington Department of Ecology on behalf of the Port of Everett, Weyerhaeuser Company, and Washington State Department of Natural Resources. September 1, 2016.
- GeoEngineers 2014a. Marine Area Remedial Investigation Sampling and Analysis Plan. Weyerhaeuser Former Mill A Site, Everett, Washington. Prepared for the Washington Department of Ecology on behalf of the Port of Everett, Weyerhaeuser Company, and Washington State Department of Natural Resources. October 16, 2014.
- GeoEngineers 2014b. Remedial Investigation and Feasibility Study Work Plan. Weyerhaeuser Former Mill A Site, Everett, Washington. Prepared for the Washington Department of Ecology on behalf of the Port of Everett, Weyerhaeuser Company, and Washington State Department of Natural Resources. October 16, 2014.
- Puget Sound Estuary Protocol 1986. Recommended Protocols for measuring conventional sediment variables in Puget Sound. Prepared by: PTI Environmental Services. Prepared for: U.S. Environmental Protection Agency, Seattle, WA and Puget Sound Water Quality Authority, Olympia, WA. March 1987; minor revision April 2003.

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Attachments:

- Table 1. Proposal for Additional Conventional and Chemical Testing
- Table 2. Test Methods, Sample Size, Containers, Preservation and Holding Times
- Figure 1. Surface Layer (0-10cm) Sediment Results, Protection of Benthic Organisms
- Figure 2. Recent Sediment Deposit Results Protection of Benthic Organisms
- Figure 3. Historical Sediment Deposit Results Protection of Benthic Organisms
- Figure 4. Surface Layer (0-10cm) Sediment Results, Protection of Human Health
- Figure 5. Recent Sediment Deposit Results Protection of Human Health
- Figure 6. Historical Sediment Deposit Results Protection of Human Health

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Table 1
Proposal for Additional Conventional and Chemical Testing
Weyerhaeuser Mill A Former Site
Everett, Washington

Sample Location ¹	Sample Identification	Sample Interval ²	Sample Horizon ³	Conventional Analyses ⁴								Chemical Analyses ⁴													
				TOC	TVS	TS	Total Ammonia	Porewater Ammonia	Total Sulfides	Porewater Sulfides	TBT	Metals	LPAHs	HPAHs	cPAHs	Chlorinated Hydrocarbons	Phthalates	Phenols	Miscellaneous Extractables	Pesticides	Herbicides	PCB Congeners	Dioxin-Like PCB Congeners	Dioxins and Furans	
2018 Former Mill A Additional Sediment Investigation																									
MAF-SS-55	MAF-SS-55_0-10	0 - 10 cm	Surface	A	A	A	A		A		A	A	A	A	○	A	A	A	A	A	A	A	A	○	
MAF-SC-55	MAF-SC-55_0-2	0 - 2 ft	Recent	A	A	A	A		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	
	MAF-SC-55_2-4	2 - 4 ft	Native	A	A	A	A		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	
	MAF-SC-55_4-6	4 - 6 ft	Native	A	A	A	A		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	
	MAF-SC-55_6-8	6 - 8 ft	Native	A	A	A	A		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	
MAF-SS-56	MAF-SS-56_0-10	0 - 10 cm	Surface	○	○	○		○		○	A	○	○	○	○	○	○	○	○	A	A	○	○	○	
MAF-SC-56	MAF-SC-56_0-2	0 - 2 ft	Recent	○	○	○	○		○		A	○	○	○	○	○	○	○	○	A	A	○	○	○	
	MAF-SC-56_2-4	2 - 4 ft	Native	○	○	○	○		○		A	○	○	○	○	○	○	○	A	A	○	○	○		
	MAF-SC-56_4-6	4 - 6 ft	Native	A	A	A	A		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	
	MAF-SC-56_6-8	6 - 8 ft	Native	A	A	A	A		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	
MAF-SS-57	MAF-SS-57_0-10	0 - 10 cm	Surface	○	○	○		○		○	A	○	○	○	○	○	○	○	A	A	○	○	○		
MAF-SC-57	MAF-SC-57_0-2	0 - 2 ft	Recent	○	○	○	○		○		A	○	○	○	○	○	○	○	A	A	○	○	○		
	MAF-SC-57_2-4	2 - 4 ft	Native	○	○	○	○		○		A	○	○	○	○	○	○	○	A	A	○	○	○		
	MAF-SC-57_4-6	4 - 6 ft	Native	A	A	A	A		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	
	MAF-SC-57_6-8	6 - 8 ft	Native	A	A	A	A		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	
MAF-SS-58	MAF-SS-58_0-10	0 - 10 cm	Surface	○	○	○		○		○	A	○	○	○	○	○	○	○	A	A	○	○	○		
MAF-SC-58	MAF-SC-58_0-2	0 - 2 ft	Recent	A	A	A	A		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	
	MAF-SC-58_2-4	2 - 4 ft	Recent	A	A	A	A		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	
	MAF-SC-58_4-6	4 - 6 ft	Native	○	○	○	○		○		A	○	○	○	○	○	○	○	A	A	○	○	○		
	MAF-SC-58_6-8	6 - 8 ft	Native	A	A	A	A		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	
MAF-SS-59	MAF-SS-59_0-10	0 - 10 cm	Surface	○	○	○		○		○	A	○	○	○	○	○	○	○	A	A	○	○	○		
MAF-SC-59	MAF-SC-59_0-2	0 - 2 ft	Recent	A	A	A	A		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	
	MAF-SC-59_2-4	2 - 4 ft	Recent	○	○	○	○		○		A	○	○	○	○	○	○	○	A	A	○	○	○		
	MAF-SC-59_4-6	4 - 6 ft	Recent	A	A	A	A		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	
	MAF-SC-59_6-8	6 - 8 ft	Native	○	○	○	○		○		A	○	○	○	○	○	○	○	A	A	○	○	○		
	MAF-SC-59_8-10	8 - 10 ft	Native	A	A	A	A		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	
MAF-SS-60	MAF-SS-60_0-10	0 - 10 cm	Surface	○	○	○		○		○	A	○	○	○	○	○	○	○	A	A	○	○	○		
MAF-SC-60	MAF-SC-60_0-2	0 - 2 ft	Recent	A	A	A	A		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	
	MAF-SC-60_2-4	2 - 4 ft	Recent	A	A	A	A		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	
	MAF-SC-60_4-6	4 - 6 ft	Recent	○	○	○	○		○		A	○	○	○	○	○	○	○	A	A	○	○	○		
	MAF-SC-60_6-8	6 - 8 ft	Recent	A	A	A	A		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	
	MAF-SC-60_8-10	8 - 10 ft	Native	○	○	○	○		○		A	○	○	○	○	○	○	○	A	A	○	○	○		
	MAF-SC-60_10-12	10 - 12 ft	Native	A	A	A	A		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	

Table 2
Test Methods, Sample Size, Containers, Preservation and Holding Times
Weyerhaeuser Mill A Former Site
Everett, Washington

Parameter	Method	Minimum Sample Size (dry wt)	Container Size and Type	Sample Preservation Technique	Holding Time for Indicated Preservation Technique
Total Organic Carbon (TOC)	PSEP 1986	125 g	8-oz WM-Glass or HDPE	Cool $\leq 6^{\circ}\text{C}$	14 days
				Freeze -18°C	6 months
Total Volatile Solids (TVS)	PSEP 1986/ SM2540G			Cool $\leq 6^{\circ}\text{C}$	14 days
				Freeze -18°C	6 months
Total Solids (TS)	PSEP 1986/ SM2540G			Cool $\leq 6^{\circ}\text{C}$	14 days
				Freeze -18°C	6 months
Bulk Ammonia	EPA 350.3	10g	From TOC/TVS Container	Cool $\leq 6^{\circ}\text{C}$	7 days
Porewater Ammonia	EPA 350.1M/SM 4500-NH3	600g /50 mL	32-oz WM-Glass	Cool $\leq 6^{\circ}\text{C}$	7 days
Porewater pH	SM 4500-H	600g /50 mL		Cool $\leq 6^{\circ}\text{C}$	analyze immediately
Bulk Sulfides	EPA 376.2/PSEP 1986	20g	2-oz WM-Glass	Zinc Acetate, Cool $\leq 6^{\circ}\text{C}$	7 days
Porewater Sulfides	EPA 376.2/SM 4500-S2	600g /50 mL	32-oz WM-Glass	Cool $\leq 6^{\circ}\text{C}$	7 days
Total Metals (As, Cd, Cr, Cu, Pb, Ag and Zn)	EPA 6010/6020	20 g	4-oz WM Glass	Cool $\leq 6^{\circ}\text{C}$	6 months
				Freeze -18°C	2 years
Mercury	EPA 7470A/7471A	2 g	From Metals Container	Cool $\leq 6^{\circ}\text{C}$	28 days

Parameter	Method	Minimum Sample Size (dry wt)	Container Size and Type	Sample Preservation Technique	Holding Time for Indicated Preservation Technique
SMS SVOCs / Bulk Tributyltin Ion	EPA 8270/8270-SIM/ Krone 1989	150 g	16-oz WM-Glass	Cool <6 °C	14 days until extraction
				Cool <6 °C	40 days after extraction
				Freeze -18 °C	1 year until extraction
Pesticides	EPA 8081B	150 g	16-oz WM-Glass	Cool <6 °C	14 days until extraction
				Cool <6 °C	40 days after extraction
				Freeze -18 °C	1 year until extraction
Herbicides	EPA 8151	150 g	16-oz WM-Glass	Cool <6 °C	14 days until extraction
				Cool <6 °C	40 days after extraction
				Freeze -18 °C	1 year until extraction
PCB Congeners	EPA 1668A	100g	4-oz WM-Glass	Cool <6 °C	1 year until extraction
Dioxins and Furans	EPA 1613	100 g	4-oz WM Amber Glass	Freeze -18 °C	1 year until extraction
Archive	NA	2 L	4x16 oz WM Glass	Freeze -18 °C	Variable

Notes:

PSEP = Puget Sound Estuary Program

ASTM = American Society for Testing and Materials

HDPE = High-density polyethylene

g = gram

mL = milliliter

L = liter

oz = ounce

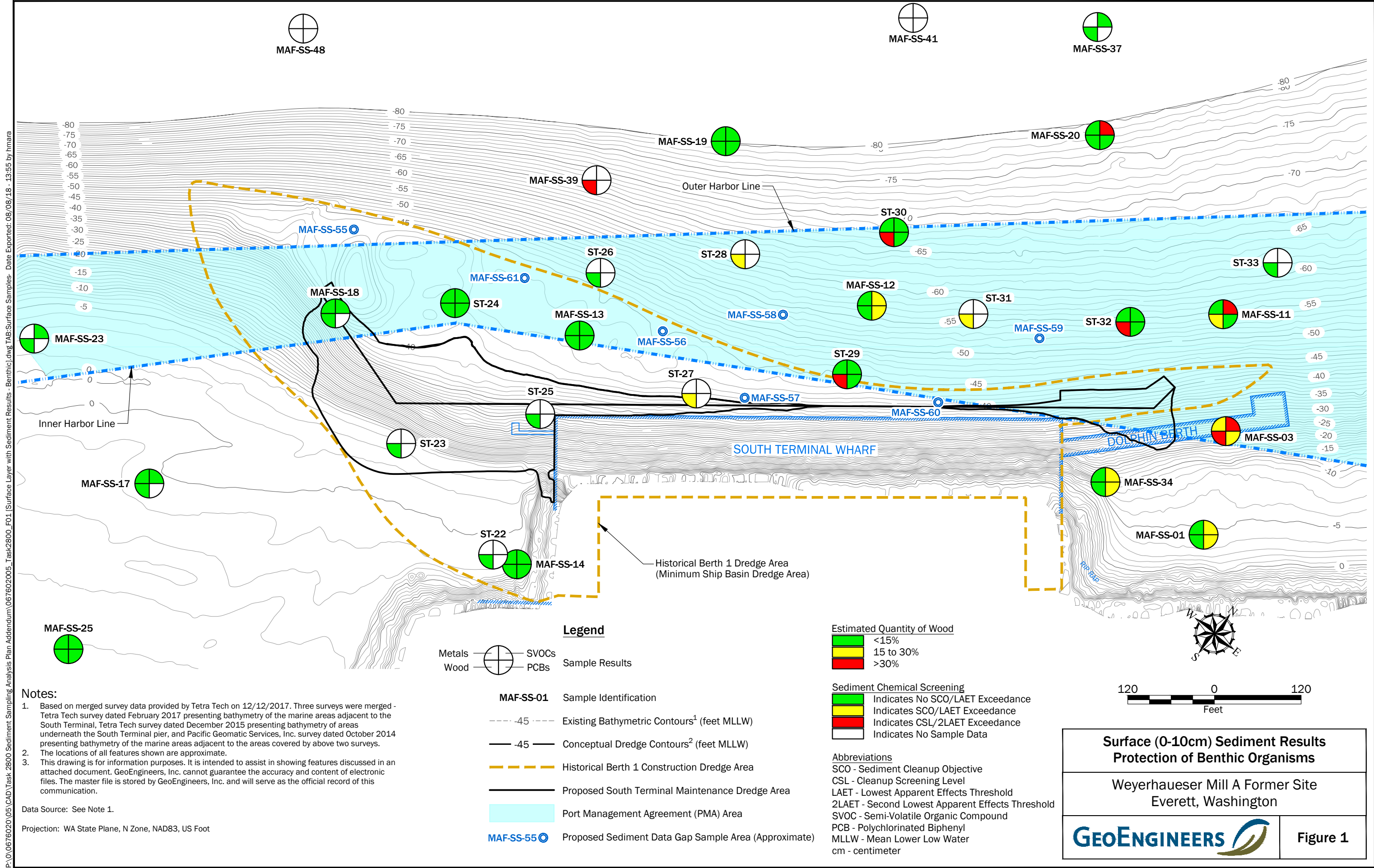
WM = wide mouth

EPA = Environmental Protection Agency

SVOCs = Semivolatile Organic Compounds

PCBs = Polychlorinated Biphenyls

SIM = Selected Ion Mode



P:\0_0676020_05\CAD\Task_2800 Sediment Sampling Analysis Plan Addendum\067602005_Task2800_F01 [Surface Layer with Sediment Results - Benthic].dwg TAB:Surface Samples Date Exported: 08/08/18 - 13:55 by hmara

- Notes:**
- Based on merged survey data provided by Tetra Tech on 12/12/2017. Three surveys were merged - Tetra Tech survey dated February 2017 presenting bathymetry of the marine areas adjacent to the South Terminal, Tetra Tech survey dated December 2015 presenting bathymetry of areas underneath the South Terminal pier, and Pacific Geomatic Services, Inc. survey dated October 2014 presenting bathymetry of the marine areas adjacent to the areas covered by above two surveys.
 - The locations of all features shown are approximate.
 - This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: See Note 1.
 Projection: WA State Plane, N Zone, NAD83, US Foot

Legend

Metals	SVOCs	Sample Results
Wood	PCBs	
MAF-SS-01	Sample Identification	
- - - - -45 - - - - -	Existing Bathymetric Contours ¹ (feet MLLW)	
— — — — —45 — — — — —	Conceptual Dredge Contours ² (feet MLLW)	
— — — — —	Historical Berth 1 Construction Dredge Area	
— — — — —	Proposed South Terminal Maintenance Dredge Area	
□	Port Management Agreement (PMA) Area	
MAF-SS-55	Proposed Sediment Data Gap Sample Area (Approximate)	

Estimated Quantity of Wood


Green	<15%
Yellow	15 to 30%
Red	>30%


Sediment Chemical Screening

Green	Indicates No SCO/LAET Exceedance
Yellow	Indicates SCO/LAET Exceedance
Red	Indicates CSL/2LAET Exceedance
White	Indicates No Sample Data

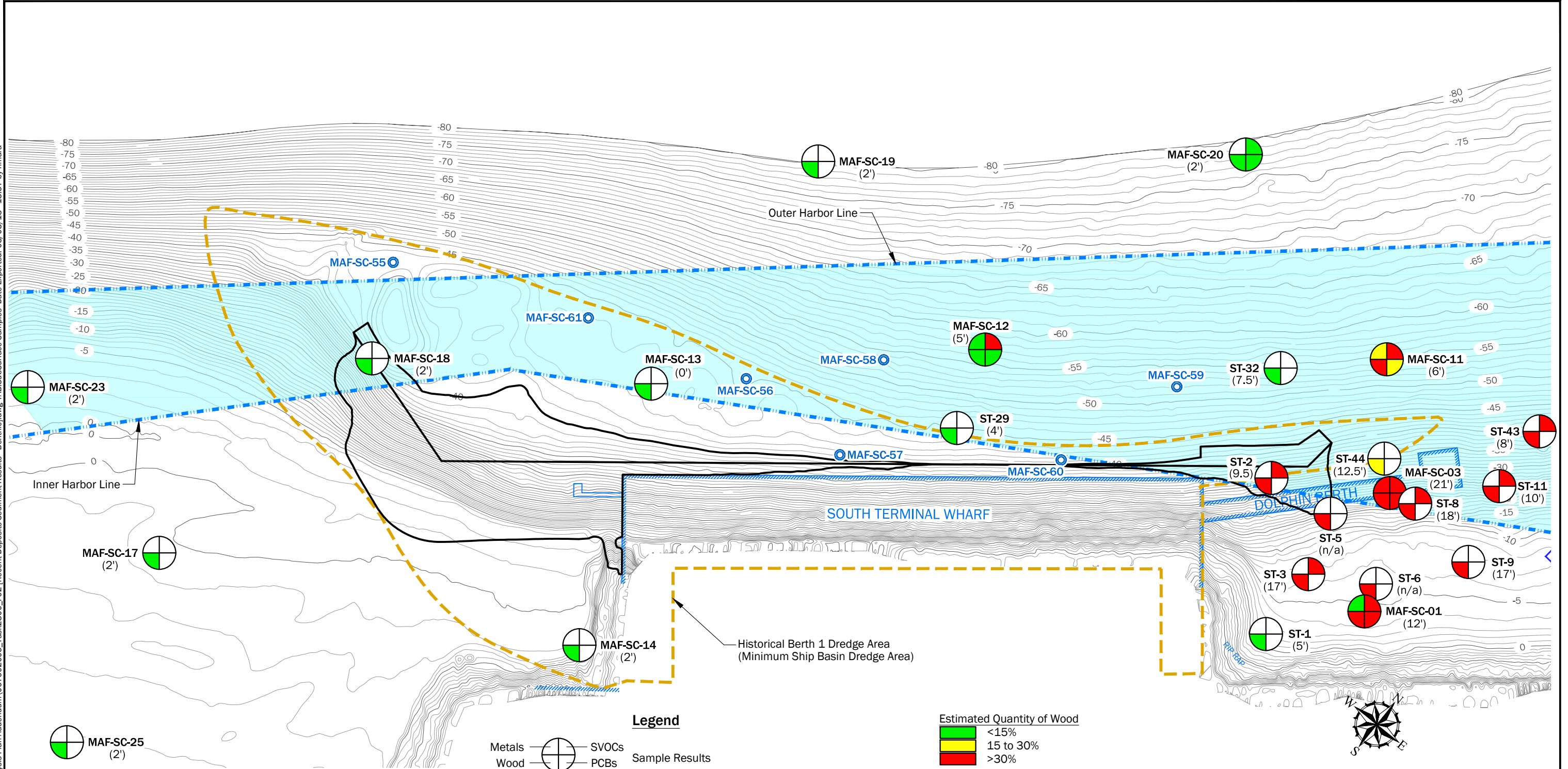
Abbreviations

SCO - Sediment Cleanup Objective
 CSL - Cleanup Screening Level
 LAET - Lowest Apparent Effects Threshold
 2LAET - Second Lowest Apparent Effects Threshold
 SVOC - Semi-Volatile Organic Compound
 PCB - Polychlorinated Biphenyl
 MLLW - Mean Lower Low Water
 cm - centimeter


 120 0 120
 Feet

Surface (0-10cm) Sediment Results Protection of Benthic Organisms	
Weyerhaeuser Mill A Former Site Everett, Washington	
	Figure 1

P:\0_0676020_05\CAD\Task_2800 Sediment Sampling Analysis Plan Addendum\067602005_Task2800_F02 [Recent Deposits Sediment Results - Benthic].dwg TAB:SubSurface Samples Date Exported: 08/08/18 - 13:57 by hmara



Notes:

1. Based on merged survey data provided by Tetra Tech on 12/12/2017. Three surveys were merged - Tetra Tech survey dated February 2017 presenting bathymetry of the marine areas adjacent to the South Terminal, Tetra Tech survey dated December 2015 presenting bathymetry of areas underneath the South Terminal pier, and Pacific Geomatic Services, Inc. survey dated October 2014 presenting bathymetry of the marine areas adjacent to the areas covered by above two surveys.
2. The locations of all features shown are approximate.
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: See Note 1.

Projection: WA State Plane, N Zone, NAD83, US Foot

Legend

Metals	SVOCs	Sample Results
Wood	PCBs	
MAF-SC-01 (12')	Sample Identification	
- - - - -45 - - - - -	Existing Bathymetric Contours ¹ (feet MLLW)	
— 45 —	Conceptual Dredge Contours ² (feet MLLW)	
- - - - -	Historical Berth 1 Construction Dredge Area	
—	Proposed South Terminal Maintenance Dredge Area	
Light Blue Area	Port Management Agreement (PMA) Area	
MAF-SC-55	Proposed Sediment Data Gap Sample Area (Approximate)	

Estimated Quantity of Wood

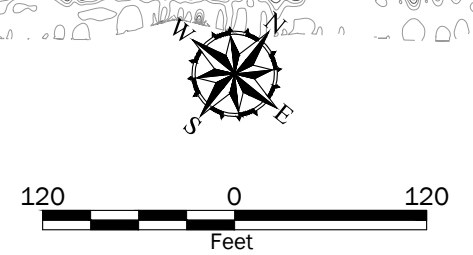
Green	<15%
Yellow	15 to 30%
Red	>30%

Sediment Chemical Screening

Green	Indicates No SCO/LAET Exceedance
Yellow	Indicates SCO/LAET Exceedance
Red	Indicates CSL/2LAET Exceedance
White	Indicates No Sample Data

Abbreviations

SCO - Sediment Cleanup Objective
 CSL - Cleanup Screening Level
 LAET - Lowest Apparent Effects Threshold
 2LAET - Second Lowest Apparent Effects Threshold
 SVOC - Semi-Volatile Organic Compound
 PCB - Polychlorinated Biphenyl
 MLLW - Mean Lower Low Water



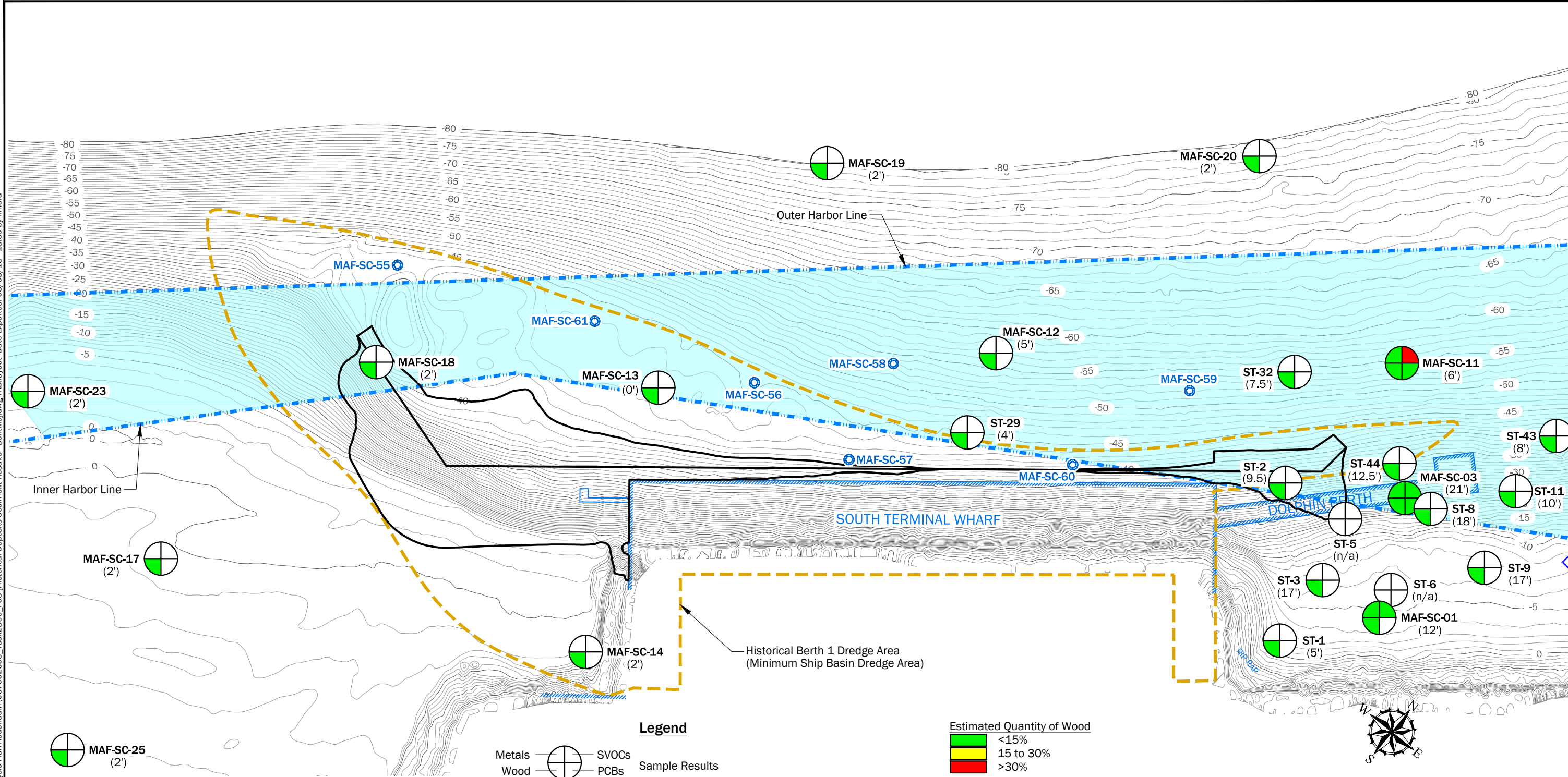
**Recent Sediment Deposit Results
Protection of Benthic Organisms**

Weyerhaeuser Mill A Former Site
Everett, Washington

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Figure 2

P:\0_0676020\05\CAD\Task_2800 Sediment Sampling Analysis Plan Addendum\067602005_Task2800_F03 Historical Deposits Sediment Results - Benthic.dwg TAB:layout Date Exported: 08/08/18 - 13:59 by hmara



Notes:

- Based on merged survey data provided by Tetra Tech on 12/12/2017. Three surveys were merged - Tetra Tech survey dated February 2017 presenting bathymetry of the marine areas adjacent to the South Terminal, Tetra Tech survey dated December 2015 presenting bathymetry of areas underneath the South Terminal pier, and Pacific Geomatic Services, Inc. survey dated October 2014 presenting bathymetry of the marine areas adjacent to the areas covered by above two surveys.
- The locations of all features shown are approximate.
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Data Source: See Note 1.

Projection: WA State Plane, N Zone, NAD83, US Foot

Legend

Metals	SVOCs	Sample Results
Wood	PCBs	
MAF-SC-01 (12')	Sample Identification	
- - - - 45 - - - -	Existing Bathymetric Contours ¹ (feet MLLW)	
— 45 —	Conceptual Dredge Contours ² (feet MLLW)	
- - - - -	Historical Berth 1 Construction Dredge Area	
— — — —	Proposed South Terminal Maintenance Dredge Area	
Light Blue Area	Port Management Agreement (PMA) Area	
MAF-SC-55	Proposed Sediment Data Gap Sample Area (Approximate)	

Estimated Quantity of Wood

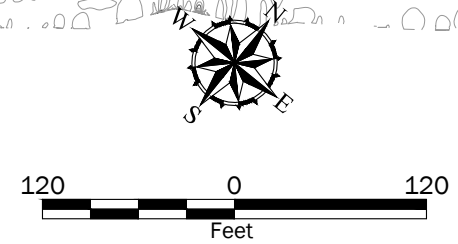
Green	<15%
Yellow	15 to 30%
Red	>30%

Sediment Chemical Screening

Green	Indicates No SCO/LAET Exceedance
Yellow	Indicates SCO/LAET Exceedance
Red	Indicates CSL/2LAET Exceedance
White	Indicates No Sample Data

Abbreviations

SCO - Sediment Cleanup Objective
 CSL - Cleanup Screening Level
 LAET - Lowest Apparent Effects Threshold
 2LAET - Second Lowest Apparent Effects Threshold
 SVOC - Semi-Volatile Organic Compound
 PCB - Polychlorinated Biphenyl
 MLLW - Mean Lower Low Water



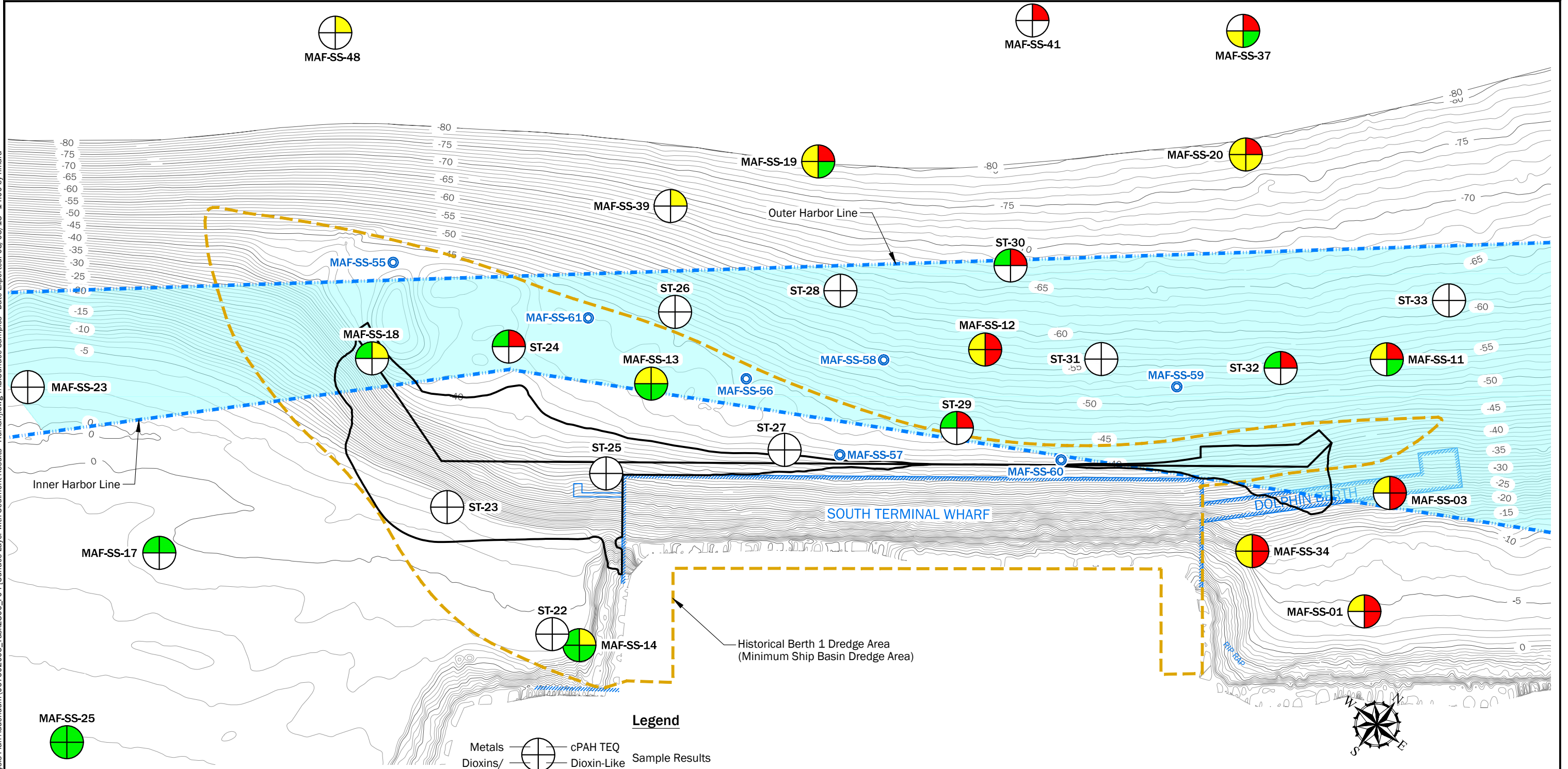
**Historical Sediment Deposit Results
Protection of Benthic Organisms**

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Figure 3

P:\0_0676020_05\CAD\Task_2800 Sediment Sampling Analysis Plan Addendum\067602005_Task2800_F04 [Surface Layer with Sediment Results - Human].dwg TAB:Surface Samples- Date Exported: 05/08/18 - 14:00 by hmara



Notes:

1. Based on merged survey data provided by Tetra Tech on 12/12/2017. Three surveys were merged - Tetra Tech survey dated February 2017 presenting bathymetry of the marine areas adjacent to the South Terminal, Tetra Tech survey dated December 2015 presenting bathymetry of areas underneath the South Terminal pier, and Pacific Geomatic Services, Inc. survey dated October 2014 presenting bathymetry of the marine areas adjacent to the areas covered by above two surveys.
2. The locations of all features shown are approximate.
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: See Note 1.

Projection: WA State Plane, N Zone, NAD83, US Foot

Legend

Metals	⊕	cPAH TEQ	Sample Results
Dioxins/ Furans	⊕	Dioxin-Like PCBs	
MAF-SS-01		Sample Identification	
---	-45-	Existing Bathymetric Contours ¹ (feet MLLW)	
---	-45-	Conceptual Dredge Contours ² (feet MLLW)	
---	---	Historical Berth 1 Construction Dredge Area	
---	---	Proposed South Terminal Maintenance Dredge Area	
---	---	Port Management Agreement (PMA) Area	
MAF-SS-55	MAF-SS-55	Proposed Sediment Data Gap Sample Area (Approximate)	

Sediment Chemical Screening

Green	Indicates No Human Health Screening Level Exceedance
Yellow	Indicates Human Health Screening Level/Natural Background Exceedance
Red	Indicates Human Health Screening Level/Regional Background Exceedance
White	Indicates No Sample Data

Abbreviations
 cPAH - Carcinogenic Aromatic Hydrocarbon
 TEQ - Toxic Equivalency Quotients
 PCB - Polychlorinated Biphenyl
 MLLW - Mean Lower Low Water
 cm - centimeters

120 0 120
Feet

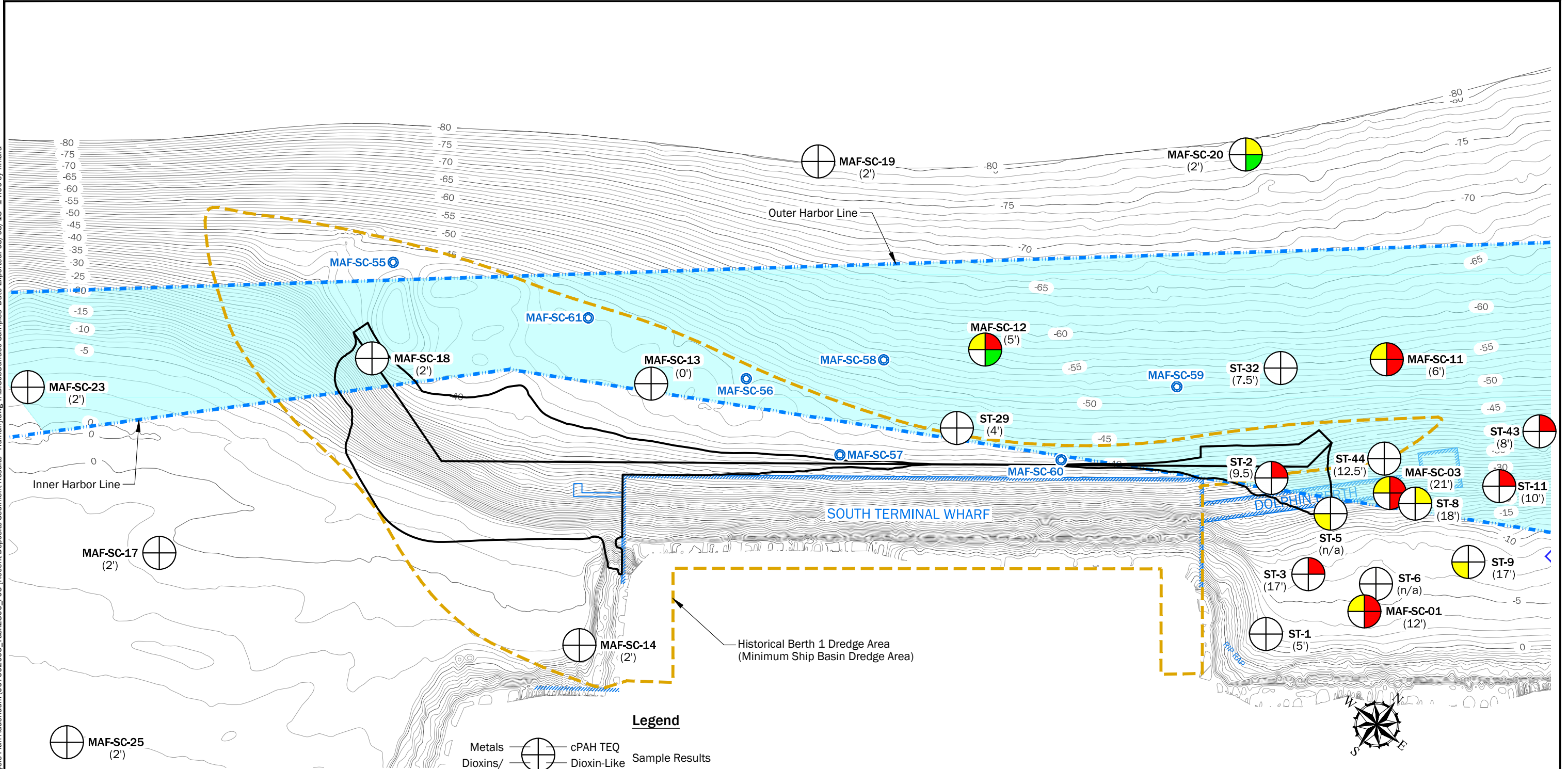
**Surface (0-10cm) Sediment Results
Protection of Human Health**

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Everett, Washington

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Figure 4

P:\0_0676020\05\CAD\Task_2800 Sediment Sampling Analysis Plan Addendum\067602005_Task2800_F05 [Recent Deposits Sediment Results - Human].dwg TAB:SubSurface Samples Date Exported: 08/08/18 - 14:00 by hmara



Notes:

- Based on merged survey data provided by Tetra Tech on 12/12/2017. Three surveys were merged - Tetra Tech survey dated February 2017 presenting bathymetry of the marine areas adjacent to the South Terminal, Tetra Tech survey dated December 2015 presenting bathymetry of areas underneath the South Terminal pier, and Pacific Geomatic Services, Inc. survey dated October 2014 presenting bathymetry of the marine areas adjacent to the areas covered by above two surveys.
- The locations of all features shown are approximate.
- This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: See Note 1.

Projection: WA State Plane, N Zone, NAD83, US Foot

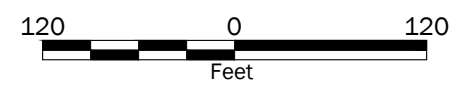
Legend

Metals	⊕	cPAH TEQ	Sample Results
Dioxins/ Furans	⊕	Dioxin-Like PCBs	
MAF-SS-01 (12')	⊕	Sample Identification	
- - - - 45 - - - -		Existing Bathymetric Contours ¹ (feet MLLW)	
— 45 —		Conceptual Dredge Contours ² (feet MLLW)	
- - - - -		Historical Berth 1 Construction Dredge Area	
— — — —		Proposed South Terminal Maintenance Dredge Area	
■		Port Management Agreement (PMA) Area	
MAF-SC-55	⊕	Proposed Sediment Data Gap Sample Area (Approximate)	

Sediment Chemical Screening

■	Indicates No Human Health Screening Level Exceedance
■	Indicates Human Health Screening Level/Natural Background Exceedance
■	Indicates Human Health Screening Level/Regional Background Exceedance
□	Indicates No Sample Data

Abbreviations
 cPAH - Carcinogenic Aromatic Hydrocarbon
 TEQ - Toxic Equivalency Quotients
 PCB - Polychlorinated Biphenyl
 MLLW - Mean Lower Low Water
 cm - centimeters



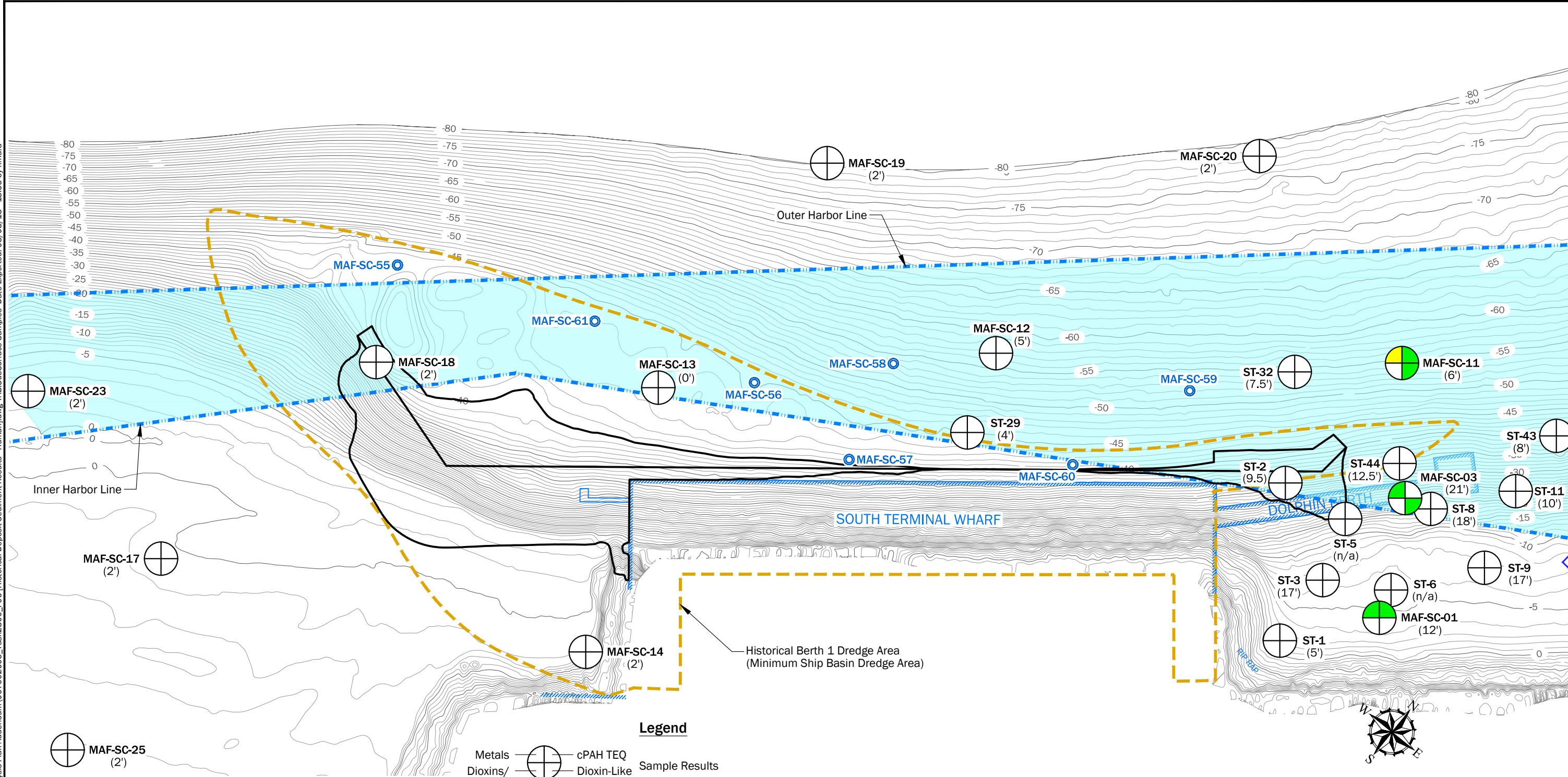
**Recent Sediment Deposit Results
Protection of Human Health**

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Figure 5

P:\0_0676020\05\CAD\Task_2800 Sediment Sampling Analysis Plan Addendum\067602005_Task2800_F06 [Historical Deposit Sediment Results - Human].dwg TAB:SubSurface Samples Date Exported: 08/08/18 - 13:55 by hmara



Notes:

1. Based on merged survey data provided by Tetra Tech on 12/12/2017. Three surveys were merged - Tetra Tech survey dated February 2017 presenting bathymetry of the marine areas adjacent to the South Terminal, Tetra Tech survey dated December 2015 presenting bathymetry of areas underneath the South Terminal pier, and Pacific Geomatic Services, Inc. survey dated October 2014 presenting bathymetry of the marine areas adjacent to the areas covered by above two surveys.
2. The locations of all features shown are approximate.
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: See Note 1.

Projection: WA State Plane, N Zone, NAD83, US Foot

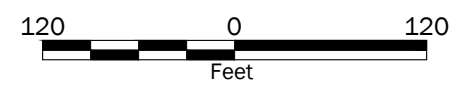
Legend

Metals	⊕	cPAH TEQ	Sample Results
Dioxins/ Furans	⊕	Dioxin-Like PCBs	Sample Results
MAF-SS-01 (12')	⊕	Sample Identification	
- - - - -45 - - - -		Existing Bathymetric Contours ¹ (feet MLLW)	
— 45 —		Conceptual Dredge Contours ² (feet MLLW)	
- - - - -45 - - - -		Historical Berth 1 Construction Dredge Area	
— 45 —		Proposed South Terminal Maintenance Dredge Area	
⊕		Port Management Agreement (PMA) Area	
⊕		Proposed Sediment Data Gap Sample Area (Approximate)	

Sediment Chemical Screening

■	Indicates No Human Health Screening Level Exceedance
■	Indicates Human Health Screening Level/Natural Background Exceedance
■	Indicates Human Health Screening Level/Regional Background Exceedance
□	Indicates No Sample Data

Abbreviations
 cPAH - Carcinogenic Aromatic Hydrocarbon
 TEQ - Toxic Equivalency Quotients
 PCB - Polychlorinated Biphenyl
 MLLW - Mean Lower Low Water
 cm - centimeters



**Historical Sediment Deposit Results
Protection of Human Health**

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Figure 6