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ANCHOR QEA

Memorandum

July 22, 2024

To: Rachel McDermott, Washington State Department of Ecology
Alison Osullivan, Suquamish Tribe

From: Clay Patmont and Jason Cornetta, Anchor QEA
Cindy Bartlett, Geosyntec Consultants

cc: Mike Warjone, Port Blakely Tree Farms
Lynn Manolopoulos and Nick Wegley, Davis Wright Tremaine
Giovanna Pagnozzi and Anne Fitzpatrick, Geosyntec Consultants

Re: Blakely Harbor Feasibility Study Work Plan Addendum: Sediment Stability and Surface Sediment Natural Recovery Sampling and Analysis Plan

Using approaches and procedures described in the *Blakely Harbor Park Site (Site) Remedial Investigation/Feasibility Study Work Plan* (Work Plan; Geosyntec 2022a) along with addenda as approved by the Washington State Department of Ecology (Ecology), sufficient data have now been collected to characterize the nature and extent of contamination in upland and aquatic areas of the Site. The draft Remedial Investigation (RI) report presenting these data is currently being prepared by Geosyntec.

To support the follow-on Feasibility Study (FS), additional data will be collected to characterize sediment stability in prospective aquatic cleanup areas at the Site and evaluate processes (i.e., sedimentation and bioturbation) that control the rate of surface sediment natural recovery in these areas. This memorandum presents an addendum to the Work Plan, describing supplemental sampling and analyses activities to evaluate sediment stability and surface sediment natural recovery in aquatic areas of the Site.

High-Resolution Sediment Core Sampling and Processing

To our knowledge, no prior investigations have been performed to characterize sedimentation rates in Blakely Harbor. However, radioisotope analyses of sediment core samples were performed in Eagle Harbor, located nearly two miles north of Blakely Harbor. Radioisotope analyses in Eagle Harbor have measured average net sedimentation rates over the past 150 years ranging between approximately 0.13 and 0.43 centimeters (cm)/year (Hart Crowser 1989, Brenner et al. 2002). Similar sedimentation rates (0.30 ± 0.15 cm/yr) have also been measured in other shallow (less than 70 feet water depth) embayments throughout Puget Sound removed from major river inputs (Anchor QEA 2018 and 2022, Floyd|Snider et al. 2020). Assuming a similar range of sedimentation rates (0.15 to 0.45 cm/yr) in Blakely Harbor, the top 3 feet of fine-grained sediment deposits at the Site likely contains the

historical record of sediment and contaminant deposition dating from present to back before Port Blakely Mill began sawmill operations in 1863 (Geosyntec 2022a).

Anchor QEA and Geosyntec selected the locations of three target high-resolution core (denoted "HRC"; Figure 1) stations based on these locations' proximity (within several hundred feet) to prospective aquatic cleanup areas at the Site and where the top 1-2 foot core interval exhibited relatively consistent accumulations of sediment fines during previous core sampling (Geosyntec 2022b). Target core locations are summarized in Table 1 and will be offset at least 3 feet from previous core stations to ensure collection of undisturbed cores.

Table 1. Target High-Resolution Core Locations

Location ID	Northing	Easting	Mudline Elevation (feet; mean lower low water)
HRC-05	222221	1224950	+2.2
HRC-29	221642	1226135	-25.9
HRC-34	222037	1226545	-19.1

At each location, 3-foot-long (approximately 90 cm) 4-inch-outside-diameter high-resolution polycarbonate cores will be advanced at least 2 feet (60 cm) below mudline. Core sampling and processing procedures are summarized in Attachment A. Additional collocated cores will be advanced as needed to obtain necessary sample volumes. If refusal is met before the core is advanced 2 feet below mudline, up to 2 additional attempts will be made. If no attempt reaches full penetration, the highest recovery attempt will be processed. Cores will be segmented into 2-cm intervals; sediment from each interval will be placed into 4-ounce glass jars and archived for radioisotope and chemical analyses as described in the following section.

Analytical Testing

Depending on the characteristics of each sediment core (e.g., lithology and initial radioisotope analyses), Anchor QEA will identify 7 to 10 sediment section intervals per location to be submitted for radioisotope testing; an additional 7 to 10 intervals per location will be submitted for chemical testing as described below. The lower number (7) would be used if the core lithology is consistent and there are no apparent anomalies in the radioisotope profile. The higher number (10) would be used if there are different lithologies observed in the cores (e.g., distinct sand lenses interbedded within silt/clay) or if there are apparent anomalies in the radioisotope profile (e.g., concentrations that don't exhibit the anticipated consistent exponential decline below the upper mixed layer; Magar et al. 2009), requiring additional sample analyses.

Radioisotope Analysis

With a half-life of 22.2 years, Lead-210 (Pb-210) activity in sediment core sections allows for reliable dating of sediment deposited over the last 100 years (Magar et al. 2009), which aligns with closure of the former Port Blakely sawmill in 1923. Characterization of sediment Pb-210 profiles can accurately reconstruct net sedimentation rates over this period, along with depths of surface sediment mixing/bioturbation. Anchor QEA identified the following 7 intervals for initial Pb-210 analysis at each core location:

0-2 cm
6-8 cm
12-14 cm
18-20 cm
24-26 cm
38-40 cm
58-60 cm

All other 2-cm intervals will be archived for contingent analysis.

Teledyne-Brown Engineering (TBE; Knoxville, TN) will perform Pb-210 analyses following Method TBE-15, with a reporting limit of 0.1 picocurie per gram. Rapid turn-around will be requested to ensure that holding times for chemical analyses are not exceeded.

Results from initial Pb-210 analysis will inform the selection of intervals for chemical testing as described below. Initial Pb-210 analysis will also inform additional sample intervals selected for further Pb-210 and/or other analyses to refine the radioisotope profile, as necessary.

Chemical Testing

Once the initial 7 sediment intervals per location have been dated from the Pb-210 analysis as described above, 7 to 10 sediment section intervals per location, including intervals representative of pre-mill (before 1863), mill operations (1863 to 1923), and five post-mill periods (approximately 1940, 1960, 1980, 2000, and 2020) will be submitted for chemical analysis to evaluate temporal trends in sediment contaminant deposition at the Site. Sediment sample intervals will be analyzed for the following conventional parameters and primary chemicals of concern identified by the RI sampling:

- Total solids
- Total organic carbon
- Metals (arsenic, lead, and mercury)
- Polycyclic aromatic hydrocarbons

- Polychlorinated dibenzo-*p*-dioxins and dibenzofurans (dioxins/furans)

If limited sample volume is available, multiple adjacent depth intervals may be homogenized by the lab into a single sample to provide a more reliable chemical analysis, as determined by Anchor QEA after the receipt of the initial Pb-210 data. All chemical analyses will follow methods and data quality objectives described in the Work Plan and addenda as approved by Ecology. Analytical Resources, LLC (Tukwila, WA) will perform all chemical analyses except dioxins/furans. SGS AXYS Analytical Services Ltd. (Sidney, BC) will perform dioxin/furan analyses.

Quality Assurance, Data Validation, and Data Management

At least one duplicate analysis will be performed for every 20 samples analyzed. Due to limited sample volume, additional material will not be collected for laboratory quality control samples.

As described in the Work Plan and addenda, analytical data will be validated to verify that data quality objectives have been met. All analytical data (including dioxins/furans) will undergo Stage 2A validation by the Geosyntec project chemist. A data validation report detailing any data quality issues and additional qualifiers will be provided with the draft FS report.

All finalized and validated data will be formatted and submitted to Ecology for entry into the Environmental Information Management System. Geosyntec will manage the overall project database and will oversee data management to ensure that analytical data are incorporated into the project database with appropriate qualifiers following acceptance of the data validation.

Project Management

The Anchor QEA Project Manager and Field Coordinator for this *Sediment Stability and Surface Sediment Natural Recovery Sampling and Analysis Plan* is Jason Cornetta:

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- Cell: 253.241.0071

References

Anchor QEA, 2018. *Operations, Maintenance, and Monitoring Plan: Port Gamble Bay Cleanup Project*. Prepared for Pope Resources and Washington State Department of Ecology. January 2018.

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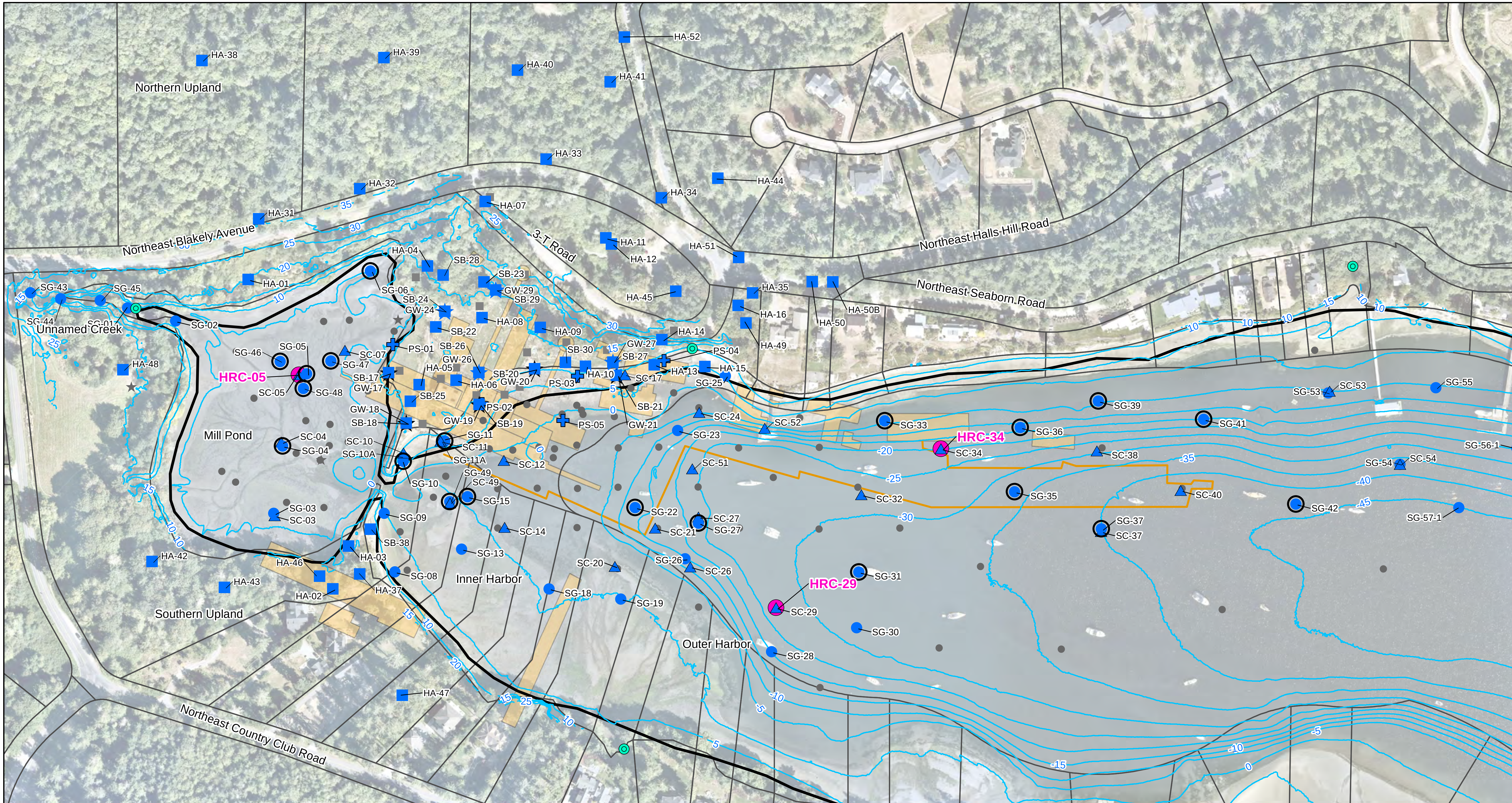

Legend

Proposed High Resolution Core Location

Sample Location

- Sediment Core
- Sediment Grab
- Soil
- Water
- Pile Scraping

Historical Sample Location

- Soil
- Sediment
- Water
- Bioassay Sample Location
- Outfall Location
- Shoreline

- Contour (5 foot MLLW)
- Historical Wharf Structure
- Tax Lot
- Structures From 1917 Map and Figure 2 in GeoEngineers, 2019

Notes:
1. Locations of historical buildings are approximate.
2. Shoreline boundary provided by Washington State Department of Natural Resources.
3. Elevation data from David Evans and Associates, 2020.
4. Background soil sample locations are approximate and may be adjusted based on field conditions.

N

0 250 Feet

Proposed High Resolution Core Locations

Feasibility Study Work Plan Addendum
Blakely Harbor Park Site
(Bainbridge Island, WA)

Geosyntec consultants

MVI/Sea | May 2024

Figure 1

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Attachment A: Standard Operating Procedure

High-Resolution Sediment Core Collection and Field Processing

Scope and Application

This Standard Operating Procedure (SOP) is applicable to the collection and field processing of high-resolution sediment cores described in the accompanying *Port Blakey Harbor Feasibility Study Work Plan Addendum: Sediment Stability and Surface Sediment Natural Recovery Sampling and Analysis Plan* (SAP). This SOP includes procedures for collection of sediment cores using push or gravity coring devices and processing of samples using a core extruding device.

Health and Safety Warnings

A safety briefing will be held at the beginning of each day and as new activities are conducted. The designated safety officer shall be responsible for ensuring the safety of personnel and will be contacted immediately in the event of an emergency. Health and safety issues for the work associated with this SOP, including physical and chemical hazards, are addressed in the Health and Safety Plan (HASP). The HASP will be followed during all activities conducted by Anchor QEA personnel as part of the evaluation.

Personnel Qualifications

Field personnel executing these procedures will have read, be familiar with, and comply with the requirements of this SOP, SAP, and HASP. All field personnel are required to take a 40-hour Occupational Safety and Health Administration Hazardous Waste Operations and Emergency Response training course and annual refresher courses, as well as participate in a medical monitoring program prior to engaging in sample collection and processing activities. Additionally, field personnel will be under the direct supervision of qualified professionals who are experienced in performing the tasks required for sample collection and processing.

Summary of Methods

Sediment core collection will be conducted from an Anchor QEA or subcontracted vessel. In shallow water, cores will be collected by advancing a polycarbonate tube into the sediment with a push core or gravity core device; required sampling equipment will be determined by conditions encountered in the field. All working surfaces and instruments will be thoroughly cleaned to minimize the potential for cross-contamination between sampling locations. Disposable gloves will be discarded after collecting and processing each sample and replaced prior to handling decontaminated instruments or work surfaces.

Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the procedures contained in this SOP (additional equipment may be required, pending field conditions):

- Sampling vessel
- Push core or gravity core device
- Differential global positioning system (DGPS)
- 3-foot-long, 4-inch-outside-diameter polycarbonate core tubes
- Caps for core tubing
- Duct tape
- Permanent markers
- Tape measure
- Taping knives
- Personal protective equipment (PPE) for field team (e.g., personal flotation devices; rain gear, steel-toed boots, nitrile gloves)
- HASP
- First aid kit
- Cell phone
- Logbooks, indelible black-ink pens
- Resealable plastic bags
- Aluminum foil
- Sample labels
- Chain of custody
- Supplies for sample shipping (e.g., cooler, wet ice, temperature blank, packing tape, custody seals)

Procedures

The steps for the collection, processing, shipping, and handling of sediment core samples are as follows:

Sediment Core Collection

1. Navigate to the target sample location with a DGPS that is pre-loaded with target coordinates.
2. When located at the target location, collect and store the coordinates in the DGPS unit.
3. Anchor the vessel in place.
4. Advance the tube into the sediment or until refusal is met.
5. Remove the core tube from the sediment and place a plastic cap on the bottom of the tube before it breaks the water surface.

6. If the top of the core tube is above the water surface after advancement, use a capped 1-foot section of tubing to fill the core tube with site water from the sampling location and cap and seal with duct tape.
7. With any top caps removed, drain surface water from the core tube and slice the tube at the sediment/water interface. Place a plastic cap on the top of the sliced core and use duct tape to seal the caps and keep them in place.
8. Label each core tube with a permanent marker to include; location ID, sample time, date, and arrow indicating the top of the core.
9. Maintain cores in an upright position during sampling and transport.
10. Store cores out of direct sunlight on wet ice until field processing can be conducted.

Sediment Core Processing

1. Slice the polycarbonate core vertically (without extrusion) with a stainless steel knife, minimizing disturbance of core sediments.
2. Take a photograph of the total core length prior to sectioning.
3. Record a description of the core sample in the field log, including the following as appropriate:
    - Date and time of sample collection
    - Sample recovery (depth interval)
    - Odors (e.g., hydrogen sulfide or petroleum)
    - Visual stratification, structure, and texture
    - Vegetation and debris, including wood (including bark, chips, and sawdust)
    - Photoionization detector readings
    - Presence of sheen

4. Cut the core into pre-selected depth intervals (2 centimeters [cm] as described in the SAP) by inserting a stainless-steel taping knife on a 2-cm template. Using a stainless steel spoon, place 2-cm sediment sample intervals into the proper 4-ounce glass sample containers. Sediment touching the walls of the core sampler will be included in the material placed into sample containers. The laboratories will homogenize the samples prior to analyses.
5. Sample containers obtained from the analytical laboratory will be labeled with the following information:
    - Project name
    - Location ID
    - Date and time
    - Analysis to be performed
    - Samplers' initials

6. Package sample containers into coolers for shipment to the analytical laboratory, including the following:
    - Bubble wrap
    - Wet ice
    - Temperature blank
    - Plastic bag liner
    - Chain of custody

7. Thoroughly clean and decontaminate all working surfaces and tools between sample intervals. Decontamination consists of washing with a detergent followed by rinsing with deionized water.
8. Discard disposable gloves and sampling tools after processing each core and replace prior to handling decontaminated instruments or work surfaces.
9. Complete chain-of-custody documentation.
10. Seal coolers with a custody seal and packing tape, and ship to the analytical laboratory priority overnight to arrive next day.